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THE PHARMACOLOGICAL SHOCK TREATMENT OF SCHIZOPHRENIA.*

A Two-Year Follow-up Study from the New York State Hospitals with Some Recommendations for the Future.

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The application of the pharmacological "shock" treatment of dementia præcox as an effective therapeutic procedure in mental institutions is justifiable if it can meet two important requirements: First, can it produce a sufficiently large increase in the improvement rate in this disease; and second, is this improvement likely to be retained. By February, 1938, a total of 1757 schizophrenics received treatment with insulin in the New York state hospitals. The number of recovered cases as well as the total number showing some degree of improvement was about three times that in a control group receiving the usual institutional treatment. When cases of relatively short duration were considered the contrast in favor of the "treated" group was even more favorable. Our experience with this treatment since February, 1938, has been just as gratifying so that insofar as the New York State Department of Mental Hygiene is concerned the first requirement seems to have been very definitely fulfilled.

It is entirely too early to state with certainty whether or not the treatment has met the second requirement, for a much longer period of observation of the treated cases will be required. However, we feel that some of the patients have been studied for a sufficiently long time to warrant some conclusions as to the likelihood of permanent results. It has been our privilege to report on three [1, 2, 3] previous occasions to this society upon the subject of this treatment. It is our purpose in the present paper to present chiefly the results of a two-year follow-up study of the first 1039

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treated cases, but in addition we shall make certain recommendations which experience has shown to be essential for the better application and evaluation of the treatment in the future.

The subjects of this study were 1039 patients with dementia præcox who received treatment in the New York civil state hospitals prior to March 1, 1938. The first analysis [4] described the condition of the patients at dates approximately 30 days after the completion of treatment, as reported by the several hospitals. It was shown that 134 patients, or 12.9 per cent, were considered recovered at the termination of treatment; 282, or 27.1 per cent, were much improved; and 263, or 25.3 per cent, were improved. A total of 679, or 65.3 per cent, thus showed varying degrees of improvement following the treatment with insulin. A comparison with a control group of first admissions with dementia præcox undergoing treatment at the same time in the New York civil state hospitals but not receiving insulin showed that only 3.5 per cent of this group had recovered within a year after admission; 11.2 per cent were much improved; and 7.4 per cent were improved. Rates of improvement or recovery in the insulin and control groups were accordingly in the ratio of 2.95 : 1.

The first test of the results was, therefore, decidedly in favor of the method of treatment by means of insulin shock. However, since a certain proportion of patients will show only temporary states of improvement, it became necessary to study the condition of the patients at adequate intervals in order to test the degree of stability of the outcome of treatment. For this reason the condition of the same group of 1039 patients treated with insulin was restudied by the several hospitals approximately one year after the treatment and the results were described in a second analysis.[5] As was anticipated, the follow-up showed that some patients who were recovered or improved at the completion of treatment were unable to maintain their improved states. The second series of observations showed that 131 patients, or 12.6 per cent of the original total, were recovered; 171, or 16.5 per cent, were much improved; 198, or 19.1 per cent, were improved; and 513, or 49.4 per cent, were unimproved. The condition of two patients could not be ascertained, and 24 had died since the beginning of treatment. We thus find that after a year the percentage of patients described as recovered remained almost constant, but that there had been a

considerable reduction in the percentage showing lesser degrees of improvement. The percentage of recoveries and improvement was reduced from 65.3 at the termination of treatment to 48.2 one year later. The latter percentage, however, was still favorable when compared with corresponding results for patients who had received other forms of therapy. It was also suggested that the outcome of treatment would probably be stabilized by the end of the second year after the termination of insulin therapy. This is borne out by the results of a second follow-up study of the original 1039 patients treated with insulin again carried out in cooperation with the several hospitals, showing the status of the patients two years after the conclusion of treatment.

We now find that 132 patients, or 12.7 per cent of the original total, were considered recovered; 148, or 14.2 per cent, were much improved; and 192, or 18.5 per cent, were improved. A total of 472, or 45.4 per cent, were consequently either recovered or improved approximately two years after the termination of treatment. This is a very close approximation to the results obtained at the close of the first follow-up period.

The stabilization in the outcome of treatment may be shown still more clearly. Of the original 134 patients described as recovered, only 73 remained in this category one year later. Of 282 patients who were originally much improved, only 111 were so described a year later, and 43 had improved to a degree considered recovered. Of 263 patients who were considered as improved, only 108 were so described a year later, though an additional 27 were considered much improved and 11 recovered. In other words, of the original recovered group only 54.5 per cent were so classified a year later. Of the much improved only 54.6 per cent were placed in the same or higher category a year later; and of the improved group only 55.6 per cent were continued in the same or higher categories a year later.

However, of those considered recovered a year after treatment, 78.6 per cent were so classified after another year, or two years after the termination of treatment. Of those described as much improved one year after treatment, 60.8 per cent were so classified after another year and 14.0 per cent were recovered, a combined percentage of 74.8. Finally, of those regarded as improved one year after treatment, 54.5 per cent were still improved after another

TABLE 1.

OUTCOME OF INSULIN TREATMENT OF PATIENTS WITH DEMENTIA PRÆCOX, SHOWING CORRELATION OF CONDITION AT TERMINATION OF TREATMENT AND CONDITION APPROXIMATELY TWO YEARS LATER.

Condition at termination of treatment.	Total.			Condition two years after termination of treatment.																	
				Recovered.			Much improved.			Improved.			Unimproved.			Unknown.			Died.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
										NUMBER.											
Recovered	71	63	134	33	31	64	8	11	19	15	7	22	12	10	22	2	2	4	1	2	3
Much improved.	158	124	282	22	25	47	45	36	81	44	19	63	39	42	81	6	2	8	2	..	2
Improved	133	130	263	6	8	14	15	14	29	46	23	69	62	84	146	1	..	1	3	1	4
Unimproved ...	156	191	347	4	3	7	7	12	19	23	15	38	115	156	271	2	..	2	5	5	10
Died	7	6	13	..	..	..	..	..	..	...	...	...	...	...	...	..	..	..	7	6	13
Total	525	514	1,039	65	67	132	75	73	148	128	64	192	228	292	520	11	4	15	18	14	32
										PER CENT.											
Recovered	100.0	100.0	100.0	46.5	49.2	47.8	11.3	17.5	14.2	21.1	11.1	16.4	16.9	15.9	16.4	2.8	3.2	3.0	1.4	3.2	2.2
Much improved.	100.0	100.0	100.0	13.9	20.2	16.7	28.5	29.0	28.7	27.8	15.3	22.3	24.7	33.9	28.7	3.8	1.6	2.8	1.3	...	0.7
Improved	100.0	100.0	100.0	4.5	6.2	5.3	11.3	10.8	11.0	34.6	17.7	26.2	46.6	64.6	55.5	0.8	...	0.4	2.3	0.8	1.5
Unimproved ...	100.0	100.0	100.0	2.6	1.6	2.0	4.5	6.3	5.5	14.7	7.9	11.0	73.7	81.7	78.1	1.3	...	0.6	3.2	2.6	2.9
Died	100.0	100.0	100.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	100.0	100.0	100.0
Total	100.0	100.0	100.0	12.4	13.0	12.7	14.3	14.2	14.2	24.4	12.5	18.5	43.4	56.8	50.0	2.1	0.8	1.4	3.4	2.7	3.1

year, 11.1 per cent were much improved, and 2.5 per cent were recovered, a total of 68.1 per cent. (See Table 2.)

From these data we appear justified in drawing the conclusion that the condition of the patients with dementia præcox treated with insulin has become practically stabilized with respect to the

TABLE 2.

OUTCOME OF INSULIN TREATMENT OF PATIENTS WITH DEMENTIA PRÆCOX, SHOWING THE CORRELATION OF CONDITION ONE YEAR AFTER TERMINATION OF TREATMENT AND CONDITION TWO YEARS AFTER SUCH TERMINATION.

Condition one year after termination of treatment.	Total.	Condition two years after termination of treatment. Recovered.	Much improved.	Improved.	Unimproved.	Unknown.	Died.
		NUMBER.					
Recovered	131	103	8	10	4	4	2
Much improved	171	24	104	15	22	6	..
Improved	198	5	22	108	60	1	2
Unimproved	513	...	14	59	433	3	4
Unknown	2	...	...	...	1	1	..
Died	24	...	...	...	...	..	24
Total	1,039	132	148	192	520	15	32
		PER CENT.					
Recovered	100.0	78.6	6.1	7.6	3.1	3.1	1.5
Much improved	100.0	14.0	60.8	8.8	12.9	3.5	...
Improved	100.0	2.5	11.1	54.5	30.3	0.5	1.0
Unimproved	100.0	...	2.7	11.5	84.4	0.6	0.8
Unknown	100.0	...	...	...	50.0	50.0	...
Died	100.0	...	...	...	...	...	...
Total	100.0	12.7	14.2	18.5	50.0	1.4	3.1

possibility of any further deterioration, and that approximately 45 per cent showed some degree of lasting improvement. The recovery rate remained practically constant at 13 per cent.

OUTCOME IN RELATION TO DURATION OF DISEASE.

The two earlier studies have shown that the rates of recovery and of improvement among patients with dementia præcox treated with insulin are highly correlated with the duration of the disease prior to treatment. The shorter the duration of the disease, the better the outcome. The same trend is shown two years after the termination of treatment. (See Table 3.) The average rate of recovery was 12.7 per cent. The rate decreased steadily, however, from a

TABLE 3.

OUTCOME OF INSULIN TREATMENT OF PATIENTS WITH DEMENTIA PRÆCOX TWO YEARS AFTER TERMINATION OF TREATMENT, ACCORDING TO DURATION OF DISEASE PRIOR TO TREATMENT.

Duration of disease prior to treatment.	Total.			Condition two years after termination of treatment. Recovered.			Much improved.			Improved.			Unimproved.			Unknown.			Died.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
NUMBER.																					
Less than 6 months..	83	86	169	23	28	51	24	18	42	16	11	27	18	28	46	1	..	1	1	1	2
6-11 months	79	74	153	18	14	32	8	11	19	19	10	29	27	37	64	2	1	3	5	1	6
1 year	103	111	214	11	15	26	19	20	39	25	12	37	44	61	105	3	..	3	1	3	4
2 years	77	70	147	5	4	9	6	6	12	20	10	30	41	47	88	2	1	3	3	2	5
3 years	49	38	87	4	..	4	4	4	8	18	6	24	20	26	46	1	2	3	2	..	2
4 years	29	32	61	2	1	3	3	3	6	10	7	17	13	21	34	1	..	1	..	..	..
5 years and over.....	105	103	208	2	5	7	11	11	22	20	8	28	65	72	137	1	..	1	6	7	13
Total	525	514	1,039	65	67	132	75	73	148	128	64	192	228	292	520	11	4	15	18	14	32
PER CENT.																					
Less than 6 months..	100.0	100.0	100.0	27.7	32.6	30.2	28.9	20.9	24.9	19.3	12.8	16.0	21.7	32.6	27.2	1.2	..	0.6	1.2	1.2	1.2
6-11 months	100.0	100.0	100.0	22.8	18.9	20.9	10.1	14.9	12.4	24.1	13.5	19.0	34.2	50.0	41.8	2.5	1.4	2.0	6.3	1.4	3.9
1 year	100.0	100.0	100.0	10.7	13.5	12.1	18.4	18.0	18.2	24.3	10.8	17.3	42.7	55.0	49.1	2.9	..	1.4	1.0	2.7	1.9
2 years	100.0	100.0	100.0	6.5	5.7	6.1	7.8	8.6	8.2	26.0	14.3	20.4	53.2	67.1	59.9	2.6	1.4	2.0	3.9	2.9	3.4
3 years	100.0	100.0	100.0	8.2	...	4.6	8.2	10.5	9.2	36.7	15.8	27.6	40.8	68.4	52.9	2.0	5.3	3.4	4.1	..	2.3
4 years	100.0	100.0	100.0	6.9	3.1	4.9	10.3	9.4	9.8	34.5	21.9	27.9	44.8	65.6	55.7	3.4	..	1.6	..	..	..
5 years and over....	100.0	100.0	100.0	1.9	4.9	3.4	10.5	10.7	10.6	19.0	7.8	13.5	61.9	69.9	65.9	1.0	..	0.5	5.7	6.8	6.2
Total	100.0	100.0	100.0	12.4	13.0	12.7	14.3	14.2	14.2	24.4	12.5	18.5	43.4	56.8	50.0	2.1	0.8	1.4	3.4	2.7	3.1

maximum of 30.2 per cent among those with a duration of less than six months prior to treatment to a minimum of 3.4 per cent among those with a duration of five years or over. The general rate of improvement showed a similar trend. Contrariwise, the per cent of unimprovement increased from 27.2 among those with the shortest duration to 65.9 among those with a duration of 5 years and over.

We also find that there is a greater stability in the results of treatment among those with a short duration of the disease. Thus, among those with a duration of less than six months who were recovered at the termination of treatment, 60.4 per cent were still recovered two years later. Of those who were much improved, 65.1 per cent were either much improved or recovered two years later. Of those who were merely improved at the close of treatment, 63.6 per cent remained in the same or in an improved condition two years later. As the duration of the disease prior to treatment increased, however, the percentages showing a deteriorated condition two years later increased. The rate of deterioration increased rapidly to approximately 70 per cent among those with a duration of three years or more.

Type of Dementia Præcox.

We may consider the outcome of treatment among patients diagnosed as hebephrenic, catatonic and paranoid. The total described as simple is too small to justify analysis. (See Table 4.) Two years after the termination of treatment the catatonic group had a recovery rate of 16.6 per cent, considerably in excess of the rate of 10.9 among the paranoids and 9.2 among the hebephrenics. The rates of improvement varied from 48.7 per cent among catatonics to 43.9 per cent among paranoids, and 40.3 per cent among hebephrenics. However, we cannot conclude from these results that there are significant changes in the rates of recovery and improvement because the latter are associated with the duration of the disease prior to treatment. When we compare recovery rates in intervals of the same duration, we find no essential differences among the several types. (See Table 5.) The few differences, especially those in the interval of less than six months, can easily be attributed to chance fluctuations. Contrary to the results shown in our previous studies, we must, therefore, hold a suspended

TABLE 4.

Outcome of Insulin Treatment of Patients with Dementia Præcox Two Years after Termination of Treatment, According to Type of Dementia Præcox.

Types.	Total.			Condition two years after termination of treatment.																
				Recovered.			Much improved.			Improved.			Unimproved.			Unknown.			Died.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
									NUMBER.											
Simple	17	7	24	2	2	4	4	1	5	6	1	7	3	3	6	1	..	1	1	..	1
Hebephrenic	98	108	206	8	11	19	10	13	23	27	14	41	53	64	117	..	1	1	..	5	5
Catatonic	151	204	355	22	37	59	28	28	56	37	21	58	55	113	168	3	1	4	6	4	10
Paranoid	256	193	449	32	17	49	33	31	64	58	26	84	115	112	227	7	2	9	11	5	16
Others and unspecified	3	2	5	1	..	1	..	..	..	..	2	2	2	...	2	..	..	..	..	..	..
Total	525	514	1,039	65	67	132	75	73	148	128	64	192	228	292	520	11	4	15	18	14	32
									PER CENT.											
Simple	100.0	100.0	100.0	11.8	28.6	16.7	23.5	14.3	20.8	35.3	14.3	29.2	17.6	42.9	25.0	5.9	..	4.2	5.9	..	4.2
Hebephrenic	100.0	100.0	100.0	8.2	10.2	9.2	10.2	12.0	11.2	27.6	13.0	19.9	54.1	59.3	56.8	..	0.9	0.5	..	4.6	2.4
Catatonic	100.0	100.0	100.0	14.6	18.1	16.6	18.5	13.7	15.8	24.5	10.3	16.3	36.4	55.4	47.3	2.0	0.5	1.1	4.0	2.0	2.8
Paranoid	100.0	100.0	100.0	12.5	8.8	10.9	12.9	16.1	14.3	22.7	13.5	18.7	44.9	58.0	50.6	2.7	1.0	2.0	4.3	2.6	3.6
Others and unspecified	100.0	100.0	100.0	33.3	...	20.0	...	...	...	...	100.0	40.0	66.7	...	40.0	..	..	..	..	..	..
Total	100.0	100.0	100.0	12.4	13.0	12.7	14.3	14.2	14.2	24.4	12.5	18.5	43.4	56.8	50.0	2.1	0.8	1.4	3.4	2.7	3.1

judgment with respect to possible differences in outcome of treatment in the several types of dementia præcox.

TABLE 5.

OUTCOME OF INSULIN TREATMENT OF PATIENTS WITH DEMENTIA PRÆCOX TWO YEARS AFTER TERMINATION OF TREATMENT, IN PER CENT, CLASSIFIED BY TYPE OF PSYCHOSIS AND DURATION OF DISEASE PRIOR TO TREATMENT.

Duration of disease prior to treatment.	Recovered.			Total improved.		
	Hebephrenic.	Catatonic.	Paranoid.	Hebephrenic.	Catatonic.	Paranoid.
Less than 6 months.....	33.3	34.1	23.3	75.0	75.3	61.7
6-11 months	17.4	27.8	17.4	52.2	53.7	49.3
1 year	10.3	11.4	11.2	33.3	48.6	51.0
2 years	3.3	3.9	9.2	40.0	33.3	33.8
3 years	7.1	3.3	2.6	28.6	36.7	46.2
4 years	6.7	...	8.0	40.0	23.5	52.0
5 years and over.....	...	8.3	3.2	29.5	29.2	24.7

TABLE 6.

PATIENTS WITH DEMENTIA PRÆCOX TREATED WITH INSULIN, SHOWING NUMBER AND PER CENT IN A HOSPITAL OR IN THE GENERAL COMMUNITY TWO YEARS AFTER TERMINATION OF TREATMENT, CLASSIFIED ACCORDING TO DURATION OF DISEASE PRIOR TO TREATMENT.

Duration of disease prior to treatment.	Number.					Per cent.				
	Total.	In a mental hospital.	In the community.	Unknown.	Died.	Total.	In a mental hospital.	In the community.	Unknown.	Died.
Less than 6 months...	169	62	104	1	2	100.0	36.7	61.5	0.6	1.2
6-11 months	153	72	73	2	6	100.0	47.1	47.7	1.3	3.9
1 year	214	131	77	2	4	100.0	61.2	36.0	0.9	1.9
2 years	147	94	45	3	5	100.0	63.9	30.6	2.0	3.4
3 years	87	58	25	2	2	100.0	66.7	28.7	2.3	2.3
4 years	61	40	20	1	..	100.0	65.6	32.8	1.6	...
5 years and over.....	208	150	44	1	13	100.0	72.1	21.2	0.5	6.2
Total 1,039	607	388	12	32		100.0	58.4	37.3	1.2	3.1

RESIDENCE OF PATIENTS.

Two years after the termination of treatment, 607 of the 1039 patients treated with insulin were still in a mental hospital, and 388 were living in the general community. The latter total included all of the 132 classified as recovered, 136 of the 148 who were much improved, and 90 of the 192 who were classified as improved. Of the 520 who were unimproved, 27 were in the community. The patients in the community represented 37.3 per cent of the total who had been treated with insulin. The percentage was correlated

with the duration of the disease before treatment, those with a duration of less than six months having the highest percentage, 61.5, and those with a duration of five years or more having a percentage of only 21.2.

An important set of comparisons may now be introduced. According to Fuller and Johnston,[6] out of a group of 2481 first admissions with dementia præcox to the New York civil state hospitals during 1909-1911, 716, or 28.9 per cent, were discharged from the hospital within two years. Among a second group of 3549 received during 1911-1916, 960, or 27.0 per cent, were discharged within two years. In a third group, admitted during 1919-1921, 1235, or 30.0 per cent, were discharged within two years. The average for the three groups was 28.7 per cent. Of the 1039 patients treated with insulin, 37.3 per cent were living in the community two years after the termination of treatment. Furthermore, of the 10,140 patients studied by Fuller and Johnston only 23.2 per cent were discharged as recovered or improved within the first two years after admission to the hospitals; whereas, 34.5 per cent of the insulin-treated group were living in the community two years after the treatment in a condition of recovery or improvement. Still further, the percentage living in the community in a condition of recovery or improvement varies with the duration of the disease before treatment. Of those patients treated with insulin within six months of the onset of the disease, almost 60 per cent were living in the community two years after termination in an improved condition.

The results of treatment of dementia præcox by means of insulin may be summarized as follows: Approximately 65 per cent of the patients so treated were in an improved condition following the termination of such therapy. Those recovered constituted 13 per cent of the total under treatment. Approximately one year after the termination of treatment, the percentage of patients showing some degree of improvement had fallen from 65 to 48. The rate of recovery remained practically constant, however. Two years after the termination of treatment the results were rapidly stabilized: forty-five per cent of the original total were in a condition of some degree of improvement, compared with 48 per cent at the close of the first year. The rate of recovery was still 13 per cent. These percentages are in significant excess of cor-

responding results for patients with dementia præcox who had received other forms of therapy in the New York civil state hospitals. Also in favor of the insulin-treated group was the percentage able to live in the community, away from the hospital, after treatment. We also found that the percentage of patients treated with insulin who were in the community after two years in a condition of recovery or of much improvement was greatly in excess of that of the general run of patients with dementia præcox. Finally, all of the results were highly correlated with the duration of the disease prior to treatment, those patients who had been ill for less than six months showing exceptionally good results. We, therefore, urge that the treatment of dementia præcox by means of insulin shock be continued and extended, and that every effort be made to encourage the application of appropriate treatment in the early stages of the disease.

It would appear that our experience with the insulin treatment definitely established it as the best single therapeutic measure for dementia præcox so far available. It produces an improvement rate significantly in excess of that obtained by any other means and after two years almost 75 per cent of the patients who were benefited have retained their improved states. If properly administered and in conjunction with other procedures of proved value, particularly early in the disease, its effectiveness will be greatly enhanced. In order to make this possible we should like to offer the following suggestions and recommendations:

I. Uniform Statistics.

Statistical studies are very necessary for the proper evaluation of our results but they have their limitations and not infrequently do not permit proper comparisons with investigations made elsewhere. It is obvious that an institution treating essentially chronic cases cannot have as high a recovery rate as another hospital whose patients belong to the so-called acute group. There are many other factors whose operation could be traced in a large carefully recorded material, factors of obviously great importance which are totally ignored in our present statistical compilations. For instance, personality factors certainly are of great prognostic significance, and the circumstances surrounding the onset of the illness surely

have some bearing upon the outcome. Thus the choice of patients for treatment should also be included in any study of the results of treatment. The need for this is clearly shown by the fact that there is a great divergence of opinion as to the prognosis in schizophrenia.

It was not so long ago that it was insisted, in some quarters, that a recovery never occurred. If it did, the diagnosis was automatically changed. Later there was a willingness to concede that cures sometimes did take place, but the consensus of opinion was that it was a chronic, progressive disease, leading frequently and, at times, rather rapidly, to deterioration. In New York State, as stated above, the recovery rate was given as 3.5 per cent. But, as soon as the pharmacological shock treatment was introduced, numerous reports of spontaneous recoveries or remissions began to appear, in some the rate was as high as 50 per cent [7] or more. Such claims can hardly be accepted in view of the increasingly large number of dementia præcox patients that fill our mental institutions to overflowing and, therefore, do not require comment. It is with the much more conservative claims, such as those of Cheney and Drewry,[8] that we do concern ourselves, for it is apparent that some very significant facts are overlooked by these investigators.

Cheney and Drewry show a recovery rate of 12 per cent in patients suffering from dementia præcox and not receiving what might, for the sake of comparison, be called specific treatment. They conclude that under conditions present in a well equipped private sanitarium results comparable to insulin treated state hospital cases are produced. They stress the importance of intensive, individualized psychotherapeutic treatment. One possible conclusion from their report is that the improvement following the use of insulin may be largely, if not entirely, due to the additional attention given these patients, while the effect of insulin itself may be questionable. However, control cases given the same attention as the treated cases show no appreciable mental changes.

Cheney and Drewry fail to mention in their paper the great difference between the types of patients treated in their institution and those found in a state hospital. The latter must accept any psychotic individual regardless of the duration or the severity of the illness while their sanitarium selects its patients very carefully, particularly as to the likelihood of their being benefited in a reason-

ably short time. Since the prognosis is so definitely related to the duration of the disease, it is to be expected that those patients receiving treatment early in their illness will be more greatly benefited than those in whom treatment is instituted rather late. If to this is added the further obvious advantages of higher intelligence, better education and financial status with its improved facilities for readjustment, it is even less surprising that generally speaking the recovery rate in the private institution is higher than in the state hospital.

The study of Cheney and Drewry is very important in that it shows what can be done for schizophrenics comparatively early in their illness by intensive treatment under most favorable conditions; but it cannot be used as a comparison with insulin as used in the state hospital.

We refer to this paper because on several occasions when we have spoken on the pharmacological shock treatment, discussants have advanced the figures reported by Drs. Cheney and Drewry to show that insulin had little or no value. We do not believe that Drs. Cheney and Drewry intended to convey this idea.

The fact that we are able to report for the various hospitals is an indication that certain statistical data are uniformly reported in New York State. However, in the light of our increasing experience these data should be supplemented by the addition of other factors referred to above.

II. Uniform Records.

What is needed more than anything else to make studies of the insulin method of general value is a more or less standardized means of recording the results of each individual treatment. Since the introduction of this therapeutic procedure there has been little uniformity in anything connected with it. Different terms are used to describe the same condition and different meanings given to the same term. Moreover, the technique has about as many variations as there are clinics using it. One cannot perhaps hope for uniformity in application of the treatment but one should expect that eventually some system of recording will be developed that can be used by all engaged in this work. One of the objections to the treatment has been that it is empirical but there is nothing

empirical about the reaction of the body to the injection of insulin. We proposed last year [3] that a chart be used based on the neurological signs that developed during the hypoglycemia and described the one employed at the Harlem Valley State Hospital. This was developed as a result of intensive, original studies of Frostig,[9, 10] but modified, extended and simplified for practical use. The purpose is to record each day by a consideration of neurological signs the probable level of the brain affected by the insulin. This provides a permanent, clear record depending on easily recognizable, physical signs and which can be used for critical examination and comparisons. The need for such a chart is shown by comparison of the results of the individual hospitals. We see that in some of the hospitals the shock treatment has proved to be very successful while in others it has been discarded as dangerous and of virtually no value. Obviously one group or the other is grossly in error. Either a great many of our patients are being subjected to unnecessary dangers or a great many others are being needlessly deprived of beneficial therapy, neither of which conditions should be allowed to prevail a minute longer than is necessary. Such widely varied opinion and practice in an otherwise fairly well standardized state hospital system is perhaps not so surprising as it might seem at first glance, when we consider the relative newness of the treatment and the enormously complicated problems which it poses. But certainly every effort should be made to reach agreement, at least where fundamentals are concerned, at the earliest possible moment, for the time has come to remove the treatment from its empirical beginnings and to endow it with some semblance of scientific respectability.

It is not suggested that the particular chart mentioned above be adopted but we do urge that those interested in and working with the Sakel treatment meet for the sole purpose of agreeing on a chart that will be acceptable to, and used by all. Such a conference is to be held in the very near future by the New York state hospitals. It is our hope that we may be able to report next year upon the value of such a uniform recording system.

III. Uniform Interpretation of Results.

Very little uniformity is noted in the literature, even insofar as the terms used to indicate the degree of improvement is concerned.

Some investigators speak of complete recovery, social recovery, pronounced improvement with defect, slight improvement with defect and unimproved (Malamud,[11] etc.). Others use the terms complete remission, social remission, partial remission, slight remission and unimproved. Still others (Rupp,[12] Fletcher) apparently do not consider any of their patients capable of recovering from dementia præcox. In New York State we have employed the same terminology in the insulin treated cases as has long been in general use in the Department of Mental Hygiene; viz., recovered, much improved, improved and unimproved as described in previous communications.[2, 13] This situation has greatly increased the difficulties in comparing the work of the various treatment groups. At least in this connection uniformity should be relatively easily obtained.

IV. The Use of Metrazol.

A word about metrazol is indicated although a discussion of the technique in general will not be included. In previous reports we have tried to discourage the use of this drug because we considered it largely ineffective when used alone and also because of the rather serious complications, notably fractures of the spine. Since the report of such severe injuries sustained during treatment with metrazol, there has been a tendency in some quarters to discontinue its use altogether. We do not believe that this attitude is justified inasmuch as a number of institutions have used the metrazol convulsion as adjunct to insulin shock with considerable effectiveness. In our own experience serious injuries have been practically eliminated by injecting the metrazol during the tonic-tetanic phase of the insulin reaction rather than during the hyper-kinetic-hypotonic phase as advised by Georgi and Sakel and others. Used in this way metrazol has a very definite place in the pharmacological shock treatment, and in many instances appears to be the factor which brings about recovery.

Finally, an attempt is being made to determine more accurately the prognosis of dementia præcox when treated with insulin. This study is now being completed and will be published in the near future. While we are not in a position to state definitely the relationship between prognosis and all the factors studied, our experience does indicate that the outcome of treatment is definitely related

to four very important factors. These are: the duration of the illness, the personality and life adjustment of the patient prior to his illness, the mode of onset and the type of dementia præcox.

Summary and Conclusions.

1. A two-year follow-up study of 1039 cases of dementia præcox treated by the pharmacological shock method in the New York state hospitals is presented and discussed.

2. It is recommended that statistical compilations include all the factors that seem to be related to the outcome of treatment.

3. Uniform recording of the treatment based upon the neurological signs of the insulin effect is advocated.

4. Uniform criteria for the interpretation of the results of treatment should be established.

5. The value of metrazol as a part of the pharmacological shock treatment is discussed.

BIBLIOGRAPHY.

1. Ross, John R.: Report of the hypoglycemic treatment in New York state hospitals. Am. J. Psychiat., 94: 131, July 1937.
2. Ross, John R.: The pharmacological shock treatment of schizophrenia. Am. J. Psychiat., 95: 769-779, January 1939.
3. Ross, John R., and Malzberg, Benjamin: A review of the results of the pharmacological shock therapy and the metrazol convulsive therapy in New York State. Am. J. Psychiat., 96: 297-316, September 1939.
4. Malzberg, Benjamin: Outcome of insulin treatment of one thousand patients with dementia præcox. Psych. Quart., 12: 528-553, July, 1938.
5. Malzberg, Benjamin: A follow-up study of patients with dementia præcox, etc. Mental Hygiene, 23: 4, 641-651, October 1939.
6. Fuller, Raymond, and Johnson, Mary: The duration of hospital life for mental patients. Psych. Quart., 5: 2, 341-352, April 1931.
7. Pollack, Benjamin: The problem of the schizophrenic and the effects of newer forms of treatment. New York State Jour. Medicine, 39: 22, 2100-2109, November 15, 1939.
8. Cheney, C. O., and Drewry, P. H.: Results of non-specific treatment of dementia præcox. Am. J. Psychiat., 95: 203, July 1938.
9. Himwich, H. E., Frostig, J. P., Fazekas, J. F., and Hadidian, Z.: The mechanism of the symptoms of insulin hypoglycemia. Am. J. Psychiat., 96: 371-385, September 1939.

10. Frostig, J. P.: Clinical observations in the insulin treatment of Schizophrenia. Am. J. Psychiat., 96: 1167-1190, March 1940.
11. Malamud, W., and Render, N.: Course and prognosis in schizophrenia. Am. J. Psychiat., 95: 1039-1054, March 1939.
12. Rupp, Charles, and Fletcher, Elizabeth K.: A five- to ten-year follow-up study of 641 schizophrenic cases. Am. J. Psychiat., 96: 877-888, January 1940.
13. Rossman, I. Murray, and Cline, Wm. B., Jr.: The pharmacological "shock" treatment of chronic schizophrenia. Am. J. Psychiat., 94: 1323-1336, May 1938.

CONTINUED FOLLOW-UP RESULTS IN INSULIN-SHOCK THERAPY AND IN CONTROL CASES.*

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In this paper I have tried to study results rather than compile statistics. For the statistics of insulin shock therapy I turn to Dr. Ross and his fellow-workers in the New York State Hospital System. What I have to present are 125 insulin-treated and 153 consecutive control schizophrenic cases from a private hospital where all cases were under the control of the same senior staff for diagnosis, treatment and follow-up judgments.

A skeptic might sum up insulin shock therapy in this cautious way: To patients caught in a disease of unknown etiology and with indefinite clinical boundaries are brought shocks which produce unknown effects in brain structure and bring results in themselves hard to measure, especially as there are not enough controls. A writer in the International Journal of Psychoanalysis [1] goes beyond skepticism when he says, "malarial inoculations by the followers of Wagner-Jauregg, insulin and metrazol—all were used for the cure of psychoses—and all have been discarded or are about to be abandoned as soon as the brief and naively spectacular claims prove false at the first contacts with the grim realities of clinical psychopathology."

Three general considerations I mention before reporting results.

It is well enough to keep insisting that the boundaries of schizophrenia are indefinite but this need not blind us to the fact that the central core of the disease is definite enough. I believe that psychiatrists who have worked together in the Pennsylvania Hospital—in any hospital—each year select from the admissions a group diagnosed schizophrenia which is remarkably uniform from year to year. That is, around the edges there will be variation and in the center uniformity.

* Read at the ninety-sixth annual meeting of The American Psychiatric Association, Cincinnati, Ohio, May 20-24, 1940.

Approaching the subject from a second angle, there is no neurological evidence of any brain damage in our 125 insulin cases. Memory, intelligence and initiative by psychological test and by observation seem as good after shock as they were before.

In the third place I have conformed to the terms used by Dr. Ross, Recovered and Much Improved, dropping the term Remission. After all, to speak of a remission when a patient has apparently recovered and is doing well, is to prejudge the result. I have tried to make Recovered correspond to Total, and Much Improved to Social Remission, placing in the lower group patients, able to adjust to families and jobs, whose mental states are marred by incomplete insight or slight emotional defect.

Insulin-Shock Results.

A first consideration is a comparison with Dr. Ross' statistics,[2] and for the sake of the comparison I put Pennsylvania Hospital figures into percentages. Dr. Ross reports the percentages of recovered and much improved on discharge, after 1 year and after 2 years. His figures are 40%, 29%, 27%. Our own figures are 51%, 36%, 29%, a close enough comparison. More of the Pennsylvania Hospital cases have shown immediate good results but in two years they are about even with the New York cases.

Into our two year result enter 5 unusual cases. One had a relapse but recovered again after a second insulin treatment. A second case relapsed after six months but recovered again after metrazol. A third case relapsed and then recovered with no treatment at all. It seems fair to include these three cases in comparison with control material: insulin shock at least did not prevent the later recoveries. In the fourth and fifth cases relapses occurred after 2 years: if we push these relapses ahead to the 2 year limit the recovered and much improved percentage drops 4 points to 25%.

In terms of duration before treatment, 58 of our patients had been ill less than 18 months before treatment, 46 had been ill 18 months or more, while in 21 patients either different attacks or conflicting statements made it unwise to set a definite duration.

Cases of less than 18 months duration had recovery-much improved percentages of 67% on discharge, 54% in one year and in two years.

It is curious that cases with a history of attacks and others whose duration was uncertain had a 60% remission rate on discharge but had all relapsed by the end of the second year.

Cases of over 18 months duration had recovery-much improved percentages of 30% on discharge and 14½% after one and two years.

Control Results.

Control cases from the Pennsylvania Hospital are consecutive admissions of schizophrenic cases followed for five years from the date of admission. The diagnoses were made by the same psychiatrists who diagnosed the insulin cases. To 116 cases previously reported were added 40 more studied by Dr. John Flumerfelt.

In such cases the date of any specific treatment is lacking and we have to reckon duration and results from the time of admission to the hospital.

These 156 consecutive cases showed a recovered-much improved rate at discharge of only 3.8%. This rose to 16% by the end of the first year and remained at that level for the second and also for the fifth years.

In these control cases there is only a slight difference between cases with duration under and over 18 months in the recovery rate.

The surprise in a comparison of our own insulin and control cases lies in the difference on discharge between 51% and 4%. At the end of one year the difference is between 36% and 16% and at the end of two years is between 29% (or 25%) and 16%. As the control cases keep on 16% for the next three years, it is possible that the downward trend of insulin-shock cases will continue until it meets the control figure. It seems sure that some recovered cases will relapse: it may well happen, however, that some now unimproved will recover, and recoveries for unknown reasons must be included in both series of cases to make a fair comparison.

It is clear that any hospital, or hospital system, must compare its shock results with its own controls. Those from another hospital will not do, although each may have its own scientific value. The Pennsylvania Hospital selects its cases: it has worked out its own ideas of what the schizophrenia of the Statistical Manual is.

Other hospitals receive only favorable cases, or only voluntary cases. Results from these hospitals are not comparable with state hospital results. Even the times vary in different studies, conditions of patients being judged anywhere from the end of treatment to twenty years after. If a certain tendency to discover good outcomes for the patients in some hospitals continues, we may be asked to consider a schizophrenic attack as a favorable event in a young life.

A complete contrast appears in that patients recovered promptly under insulin treatment and 95% left the hospital within a month of the treatments. Those patients who recovered under ordinary hospital treatment, except in a very few instances, had to wait from 1 to 3 years for the improvement.

Individual Instances.

The result in an individual case has an importance sometimes lost in a group.

In a man schizophrenic for six years, deeply seclusive and violent, insulin shock for six days produced an easy friendliness which took by surprise his nurses and fellow-patients and greatly improved the morale of the ward. He was unimproved at the end of the treatment.

A change began at 16 in a girl in the direction of seclusiveness, "scattered reading," stubbornness and projection. At 21 guilt feeling centering around love and hate of her father and mother found expression in the delusion that she gave off a bad odor. At 23 came somatic complaints and great trouble in managing sexual impulses which led to retiring from difficulties to bed. In her own words, "to live like a responsible adult caused physical pain." At 28 she felt "like several different persons, none of them myself:" "the parts of my body seemed disconnected." Insulin-shock, remarkably described by the patient, brought spontaneity and emotional ease for nine months. Success in artistic work was following when gradually all the old tendencies returned—seclusiveness, projection, love and hate centering on her father (a bad odor), and retirement to invalidism.

A third patient was under the observation of a psychiatrist in his sanitarium for two weeks before insulin treatment. A year

and a half after treatment this patient relapsed and returned to the same sanitarium and psychiatrist. Although many of her schizophrenic symptoms had returned, this psychiatrist was surprised to find seclusiveness and inaccessibility changed to an open friendliness which was patchy but unmistakable.

In these three cases, all carried as unimproved in the two year follow-up, there is evidence that insulin-shock pulled in the right direction but was too weak, or too brief in its action, to make permanent headway against the deep currents of the disease process. In the patients who remain well after two years, perhaps the currents were less deep.

SUMMARY.

This is a study of one hospital working out for itself answers to questions raised by the use of insulin-shock in schizophrenia.

At the Pennsylvania Hospital there have been immediate and important gains in one-half of all patients, and in two-thirds of acute cases (less than 18 months in duration).

After two years these gains remained in only one-fourth of all patients, but in one-half of the acute cases.

Control cases in the same hospital were found to show similar gains, two years from the time of admission, in one-sixth of all cases. These gains were without important relation to the previous duration of illness.

The experience of one hospital indicates that insulin-shock is a strikingly effective agent in schizophrenia. It also indicates a need for supportive measures to hold more firmly the gains that come quickly but which often tend to disappear.

BIBLIOGRAPHY.

1. Zilboorg, Gregory: The fundamental conflict with psycho-analysis. Internatl. Jl. of Psycho-Analysis, Vol. XX, Parts 3 and 4, 1939.
2. Ross, John R., Rossman, I. Murray, Cline, William B., Jr., Schwoerer, Oscar J. (by courtesy), and Malzberg, Benjamin (by courtesy): A statistical study of results of pharmacological shock therapy in the New York State Hospitals. Read at the ninety-sixth annual meeting of The American Psychiatric Association, May 23, 1940.

PROGNOSTIC FACTORS IN INSULIN SHOCK THERAPY.*

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The study of a group of dementia præcox patients treated by the insulin shock method permits a comparison of the outcome of patients so treated with that of patients treated by the usual methods in the same hospital. In addition, such a study may be expected to furnish factual data by which one can determine what types of patients are likely to benefit or to receive no benefit from this form of therapy. The rational use of any treatment makes such prognostic criteria desirable.

In an attempt to discover such facts we have investigated the records of a small but carefully studied group of 50 patients suffering from dementia præcox who were treated by the insulin shock method at the New York Hospital, Westchester Division, in the two and three-quarter years' period from December 1936 to September 1939. Personal observations have been made or reports received on the further course of each of these patients. The time elapsed since the termination of insulin treatment has varied from six months to approximately two and a half years.

The group consisted of 18 men and 32 women. They were relatively young, with a median age of 29 years. The youngest was 14 and the oldest 49. Thirty-five were single, 13 were married and two were divorced. They were a well-educated group; 17 had had four years and 13 others at least one year at college; three had attended only grammar school but the remaining 17 had had at least a high school, preparatory or finishing school education. Twenty-one were considered to have had adequate pre-psychotic personalities as evidenced by at least a reasonably consistent record of adjustment before illness. Occupations of the patients included those of lawyers, college teachers, nurses, secretaries and house-

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wives. Twelve of the group were students while eight had no definite occupation.

Insulin shock treatment was carried out essentially according to the method described by Sakel except that great importance was attached to the use of psychotherapy as well as other therapeutic procedures such as occupational therapy and physical education. Patients were considered *recovered* if they became symptom free, had insight, were apparently as well as before illness and were able to occupy themselves in their previous work. Those who had improved to the point of showing satisfactory social behavior although still presenting minor evidences of illness recognizable by a physician were regarded as *much improved*. Patients were considered *improved* if they showed better contact with their surroundings and improvement in their behavior sufficient to enable them to reside on a more comfortable hall in the hospital.

It was customary to treat these patients intensively by insulin shock for at least six weeks and longer if improvement seemed to warrant such a course unless satisfactory improvement or poor physical response made a shorter treatment desirable. The median length of insulin shock treatment in this group was 52 days. The longest course of treatment was 99 days while the shortest was 8 days.* The median number of insulin injections given was 41 and the median number of comas was 16. The men required more insulin than the women to produce coma with a median dose of 148 units in the former compared to 90 units in the latter.

At the termination of insulin treatment no patient was considered recovered, 15 or 30% were much improved, 9 or 18% were improved, a total of 24 or 48% thus showing benefit; 26 or 52% were unimproved. The median length of hospital treatment in those showing improvement was four and a half months from the beginning of insulin therapy. No patient appeared to have been made worse mentally or to have had more than temporary adverse physical effects from the treatment.

At the end of the follow-up extending over a period of from six months to approximately two and a half years after the termination of insulin treatment, eight (16%) were recovered, five (10%)

* Treatment in this patient was discontinued because of unfavorable physical reaction.

were much improved and five (10%) were improved, making a total of 18 (36%) who continued to show improvement while 32 patients (64%) were unimproved.*

These results are to be compared with those of Cheney and Drewry who reported in 1938 on the results of non-specific treatment of 500 cases of dementia præcox in this hospital. These authors found that at periods of from two to 12 years after the date of their discharge from the hospital, 12% of the patients were recovered, 14% were much improved and 16% were improved, a total improvement of 42%; 58% were unimproved. The figures from the previous and the present studies indicate the approximation of the results which may be expected from insulin shock therapy and from the non-specific treatment of dementia præcox patients after a substantial length of time has elapsed following either type of treatment.

At the time of the follow-up of from six months to two and a half years following the termination of their insulin treatment 16 of the 50 patients of the present study were at home. Eight of them were recovered and five were much improved; all 13 patients were able to carry on their usual occupations or to meet the requirements of their social groups. Three improved patients who were still properly hospital cases were maintained at home with special care.

The 24 patients in the group who responded favorably to insulin shock therapy did so within a relatively short length of time. Twelve had improved within ten days, 19 within 20 days, 21 within 30 days, and all within 40 days. But of the 26 patients who showed no improvement at the end of insulin therapy only five showed subsequent improvement and they remained properly hospital cases.

From a detailed study of the group of 50 patients just described we will now consider certain factors with regard to their prognostic values in estimating the possibilities for improvement, both at the end of treatment and after the period of follow-up, in patients treated by insulin shock therapy.

* One unimproved woman patient who died one and one half years following the termination of insulin treatment will for the sake of convenience be designated as "unimproved."

Sex.

The male patients showed a definitely greater tendency to improve than the females. At termination of the insulin shock treatment 10 of 18 male patients as compared with only 14 of 32 females were in an improved condition. At the time of follow-up the greater improvement in the males was still more obvious with four males recovered, four much improved and three improved or a total of 61% as compared with 22% improvement in the total group of 32 females of whom only four were recovered, one much improved, two improved and 25 unimproved.

That greater improvement is to be expected from insulin shock therapy in male patients is borne out by an investigation of the figures presented by Malzberg of a large group of 1039 dementia præcox patients treated in the New York State Hospitals. This study of a comparable number of men and women at the end of treatment showed 69% of the men and 62% of the women were benefited, while at the end of a two-year follow-up 51% of the men and only 39.8% of the women had shown improvement.

Age at the Time of Treatment.

The best results were obtained in the treatment of young patients as demonstrated by the fact that at the end of insulin shock therapy four of the six patients who were from 14 to 19 years of age, 11 of the 21 patients ranging from 20 to 29 years, eight of 20 between the ages of 30 and 39 and one of the three from 40 to 49 years, were in an improved state. Approximately the same situation prevailed in the follow-up studies where it was found that half of the youngest age group were benefited with two recovered and one much improved. Of those in the decade from 20 to 29 years, five were recovered, three much improved, and three improved or a total of 11 of 21 who received benefit from treatment. The 20 patients who were in their fourth decade at the time of treatment showed less improvement, with one recovered, one much improved and two improved or a total of four of 20 in an improved state, while none of the three patients over 40 years of age was improved. These figures show a definite fall in the improvement rate directly relating to the greater age of the patient at the time of treatment.

Pre-Psychotic Personality.

From the standpoint of a predominating history of achievement and satisfactory life adjustment, 21 patients were considered to have had an adequate personality. Thirteen of these were benefited at the termination of insulin treatment as compared with only eleven of 29 patients with inadequate pre-psychotic personalities. The favorable prognostic import of an adequate pre-psychotic personality was further indicated at the time of follow-up when 43% of this group showed improvement as compared with 31% of the latter.

Recovery from Previous Psychosis.

The histories of 12 of the patients indicated that they had recovered from previous psychotic episodes, in several instances of only a few weeks' duration. The proper diagnosis of these attacks was obscure except in the case of five who were known to have had dementia præcox, four having been diagnosed as catatonic and one hebephrenic. At the termination of insulin shock therapy six of the 12 were very much improved including the four with the previous catatonic and the one with the hebephrenic attacks. At the time of follow-up only two were recovered and one much improved, indicating no tendency for a greater percentage of improvement to be expected in this group than in the total group of 50 patients. It is interesting to note that the much improved patient had been treated by usual methods in this hospital ten years previously for catatonic dementia præcox. She had been deeply regressed and had required two years to make a recovery. With the use of insulin shock therapy in her present attack which was very similar in nature to her previous one, she left the hospital in nearly as good a remission after eight and a half months of hospital treatment as she had attained previously after two years of the usual treatment.

Adequacy of Precipitating Causes of Psychoses.

The results of insulin shock therapy were studied with regard to the presence or absence of apparently adequate external precipitating causes; that is to say, when the psychosis appeared to occur

in definite relation to loss sustained by the patient or to the development of difficult problems which the patient was unable to solve. The psychoses of 14 patients appeared precipitated by such adequate external factors and of this group seven were much improved and four improved at the end of insulin therapy. In the case of the remaining 36 patients whose psychoses appeared to rise largely out of personality factors only eight were much improved and five improved. At the time of follow-up the 14 patients whose psychoses appeared related to adequate external precipitating causes revealed seven recovered, one much improved and one improved, while of the latter group of 36 patients only one had recovered, four were much improved and four were improved.

Character of Onset of Psychosis.

Excellent results were obtained in ten patients in whom the psychoses appeared to have developed acutely over a period of one month or less. Six were much improved and three improved, while of the 40 patients whose illness developed insidiously over a period of from one month to several years, only nine were much improved and six improved at the end of insulin shock treatment. The follow-up revealed that eight of the ten acutely developing cases had benefited, with six recovered, one much improved and one improved, while only ten of the 40 patients whose psychoses were of gradual development had shown improvement, with two recovered, four much improved, and four improved.

Duration of Illness Before Treatment.

Twenty-two of the group of 50 patients had been ill for one year or less before insulin shock treatment was given. Twelve were much improved and five were improved, making a total of 17 (77%) who showed improvement in the acutely ill group as compared with only 48% improvement in the group as a whole.

Three of twelve patients having a duration of illness of from one to three years before treatment were much improved and two improved, while only two of 16 patients who had been ill from three to 24 years were improved. At the time of follow-up, the best results had been obtained in the 22 patients whose illness had lasted less than a year. Seven of them were recovered, four much

improved and one improved as compared to one recovered and three improved in the group of 12 patients whose illness had lasted from one to three years. Very poor results were obtained in 16 patients who had been psychotic from three to 24 years with only one of the group much improved and one improved.

Type of Dementia Præcox.

The patients with paranoid dementia præcox were benefited the most at the termination of treatment with six out of 11 as compared with four of the eight hebephrenics, 14 of 29 catatonics, and neither of the two patients with the mixed type of dementia præcox showing improvement. The catatonic type, however, showed the best results at the time of follow-up with six recovered, four much improved and three improved or a total of 45% benefited. The other types had done poorly. Two of the 11 paranoid patients had recovered. Of the eight hebephrenics, one was much improved and two were improved, while the two patients with the mixed type of dementia præcox remained unimproved.

Clinical State at the Time of Treatment.

It has been thought that some clinical states, for instance stupors, do not respond to insulin shock therapy as well as others. Of 20 patients who were in an excited state at the beginning of treatment twelve showed improvement. Of 20 apathetic patients, eight were benefited and three out of five stuporous patients and one of two bewildered patients were improved. None of the 3 conspicuously depressed patients showed any improvement. That is, at the termination of treatment the excited and stuporous patients showed equal rates of improvement while the depressed patients had responded very poorly. The excited patients showed the best response on follow-up with 11 of 20 showing improvement as compared with two of five stuporous patients, four of 20 apathetic patients and one of two bewildered patients who were benefited. The depressed patients continued to do very poorly, all three remaining unimproved.

Presence of Deterioration.

Eighteen patients were considered deteriorated at the beginning of insulin shock therapy. Deterioration was judged to be present when a patient showed consistent lack of attention to personal habits, bizarre behavior, disconnected thinking and apathy. At the termination of treatment two of this group were much improved and three were improved. At the time of the follow-up, however, only two were improved as compared with 16 of 32 showing improvement among those who were not deteriorated.

Patient's Attitude Toward Insulin Shock Treatment.

The question arises as to how the patient's attitude toward insulin shock therapy influences the result. Twelve patients usually expressed themselves as wishing the treatment. Of these, seven showed improvement while of the 23 patients who definitely resisted treatment, 11 were benefited and of the 15 who were indifferent six were in an improved state at the end of treatment. At the time of follow-up 39% of those who had objected to the treatment were improved as compared to 33% of those who wished treatment and 33% of those who were indifferent. It is of interest that two patients with insight who wished the treatment because they hoped it would help them were unimproved at the follow-up although one had been improved at the termination of treatment. Two patients who objected to the treatment because it made them feel "fuzzy" and "woozy" were much improved at the end of treatment and recovered at the follow-up. The attitude toward treatment had little to do with the final result.

The Amount of Treatment Received.

The results of the treatment bore no constant relation to the amount of shock dose of insulin given, to the duration of treatment or to the number of convulsions or comas. The much improved females received slightly greater shock doses than those who were unimproved while the reverse was true of the males. The much improved females had a median of 35 days of treatment as compared to 56 days for those improved and 52 days for those who were unimproved. The much improved males with a median of

48 days had less treatment than the improved males with 55 days or the unimproved males with 55 days. The much improved females had a median of 17 comas as compared to 20 for those who were improved and 15 for those unimproved. The males who were much improved had had a median of only eight comas as compared with 33 for the improved and 31 for the unimproved. At the time of follow-up both the recovered males and females had had fewer comas and fewer days of treatment than in the much improved, improved or unimproved groups. Convulsions occurred in the treatment of 20 patients with an apparent beneficial effect on the course of illness in two patients who subsequently improved rapidly. The greatest number of convulsions occurred in two patients one of whom had five and the other six. These patients were unimproved at the termination of treatment and at the time of the follow-up.

Conclusions.

The study of the results in 50 cases of dementia præcox from six months to two and a half years after insulin shock therapy, with special reference to certain factors considered for their prognostic significance, suggests the following conclusions with relation to prognosis:

The dementia præcox patient who has the best outlook for recovery or improvement following insulin therapy is a male under the age of thirty who has had a comparatively adequate pre-psychotic personality, whose psychosis had an abrupt onset with a definite external precipitating cause. He will have been sick less than a year before the institution of treatment; he will have shown an excited catatonic state without evidence of what we have called deterioration, which is defined as consistent lack of attention to personal habits, bizarre behavior, disconnected thinking, and apathy.

Conversely, the patient not likely to benefit by hypoglycemic treatment will be a female over thirty who, with an inadequate personality, insidiously and without definite external precipitating cause, has developed over a period of more than a year before treatment a mixed form of dementia præcox with evidence of deterioration as defined above.

Obviously, various combinations of these prognostically good and bad factors will occur in different patients and their relative predominance will have an influence in determining the outcome.

In general, patients who will improve begin to show such improvement within a comparatively short time after the beginning of treatment, and on the other hand if improvement is not shown within a comparatively short time, long-continued treatment does not tend to bring about improvement.

Previous attacks with remission do not seem to have an influence on the general outcome.

It will be obvious that in this study of insulin-treated cases we have found of good prognostic significance factors that long before the institution of this form of treatment were recognized as having such significance. In other words, patients who will benefit by insulin treatment will have the same characteristics as those benefited formerly with other forms of treatment. This supports our conviction that insulin does not have a specific curative effect but that it may bring about changes that accelerate or facilitate improvement in those who have the constitutional capacity for such improvement or recovery.

It is our conviction that insulin therapy should be supplemented by psychotherapy, occupational therapy, and other psychiatric adjuncts suitably applied to give the patient the best opportunity for benefit.

The study of our series seems to indicate that with such extensive and intensive treatment, of a group of cases of dementia præcox such as constituted our material 16% may be expected to be recovered and about half be benefited six months to two and a half years after insulin treatment. The treatment of favorable cases, however, may result in an improvement rate of 90% at the end of the insulin treatment and of 80% at the end of six months to two and a half years after treatment. The results obtained in the group as a whole (16% recovered and a total of 36% benefited by treatment) may be compared with results reported by us two years ago in 500 cases of dementia præcox treated in the same hospital and with the same methods, with the exception of insulin, viz., 12% recovered, and 42% benefited by treatment.

For those who improved sufficiently to leave the hospital the median hospital residence after the beginning of treatment was

four and a half months. It seems reasonable to expect, therefore, that if a case of dementia præcox receives insulin therapy supplemented by other psychiatric adjuncts soon after admission to the hospital, the hospital residence of such a patient may be appreciably shorter than if insulin therapy were not used.

BIBLIOGRAPHY.

1. Cheney, C. O., and Drewry, P. H.: Results of non-specific treatment in dementia præcox. Am. J. Psychiat., 95: 203 (July), 1938.
2. Malzberg, B.: A two-year follow-up study of dementia præcox treated with insulin. Quarterly Conference of State Department of Mental Hygiene, Albany, N. Y., March 23, 1940.
3. Sakel, M.: Nervous and Mental Diseases, Monograph No. 62, 1938.

CURARE: A PREVENTIVE OF TRAUMATIC COMPLICATIONS IN CONVULSIVE SHOCK THERAPY.*

(Including a Preliminary Report on a Synthetic Curare-Like Drug.)

By A. E. BENNETT, M. D., Omaha.

Since L. Meduna,[1] in 1935, introduced convulsive (metrazol) shock therapy for schizophrenia, over 1000 articles attempting to evaluate its usefulness have appeared in the world's literature. The immediate results in early schizophrenic states appeared to be at least equal to those reported from Sakel's hypoglycemic shock therapy. The follow-up reports, however, indicated that sustained results are inferior to those of insulin shock therapy and possibly no greater than those of previous psychiatric treatment methods.

Since my preliminary report[2] on 21 cases of chronic resistant affective disorders in February of 1938, many others have confirmed its usefulness. A recent follow-up study[3] of 70 cases, after six months to two years, indicates that 90 per cent of severe depressive reactions can be terminated within two to three weeks of treatment with about 10 to 15 per cent of relapses. The results obtained in the midlife, involutional and presenile depressive states over a long period of time suggest that in these forms of mental illness convulsive shock therapy offers the greatest field of usefulness.

In spite of these results, because of certain hazards in the treatment—particularly the traumatic complications, this revolutionary psychiatric treatment has been seriously condemned by many workers and totally abandoned by some. Recently at prominent national meetings such remarks as these have been made by neuropsychiatrists whose opinions bear great weight: "I give

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From the psychiatric departments of the Bishop Clarkson Memorial Hospital, University of Nebraska College of Medicine, Omaha, and the Lincoln State Hospital, Lincoln, Nebraska.

the treatment just one more year to survive," "I think we should wake up now to the fact that this is not real therapy. Anything that actually injures the patient whom we are supposed to be looking after should be stopped. The use of metrazol is the use of a perfectly dreadful drug."

I can only conclude that such remarks are made by individuals who have not had extensive experience with this therapy. In my opinion, it is one of the real revolutionary therapies of modern psychiatry. Its use is still empiric, as was malarial therapy 20 years ago, with its hazards and complications, until replaced by safer, less hazardous, more efficient artificial fever combined with chemotherapy.[4] Convulsive shock therapy will remain until replaced by some more specific measure, since there is something fundamentally sound in this therapy, never approached heretofore in effectiveness, in depressive stupor, mixed catatonic or chronic manic excitement states.

The problem of traumatic complications, because of the severity of the convulsion induced by metrazol, has greatly restricted its usefulness and has raised the question whether the treatment could survive in its raw state. The incidence of serious extremity fractures of humerus or femur has been 1.5 to 2 per cent and dislocations 17.2 per cent.[5] Compressive fractures of the spine have been carefully evaluated as 43 to 51 per cent.[6]

For the past two years the seriousness of this problem has prevented my giving any metrazol treatment without instituting prophylactic measures. We first tried hyperextensive procedures of the spine, under orthopedic guidance, restraining the pelvis, hips and shoulders to prevent flexor spasms of the spine and adducting the arms, without complete success. In addition, we tried administering metrazol after first inducing insulin coma, on the theory that insulin shock produced hypotonia sufficient to prevent fracture complications. Later, we added spinal anesthesia[7] to paralyze back and lower extremities, thus adequately preventing spinal and lower extremity fractures. But this method had obvious objections; it left the arms unprotected and a shoulder fracture occurred in one case. None of these measures—orthopedic restraint, preliminary upbuilding (calcium, viosterol, etc.), or even spinal anesthesia would prevent all complications. The fundamental problem was still the severity of the convulsive seizures.

We then attempted to find less severe convulsant drugs and experimented with tutin, picrotoxin and coriamyrtin. We found none of these drugs would produce seizures sufficiently mild to prevent fractures. We also tried total nitrogen inhalation, as recommended by Alexander and Himwich,[8] but found it therapeutically ineffective.

The problem resolved itself into finding some method of softening or lessening the convulsive seizure and still preserving the therapeutic effectiveness.

The principle of curarization or blocking the neuromuscular junction to prevent excessive nerve impulses from reaching the muscles seemed theoretically feasible. Through the courtesy of Mr. Richard C. Gill, who had recently returned from South America with the largest amount of curare ever available for experimental research, and E. R. Squibb and Sons, together with the assistance of Dr. A. R. McIntyre, professor of pharmacology at the University of Nebraska, we have been able to carry out extensive studies with the drug.

Historical Résumé of Available Information on Curare.

Since time immemorial, South American Indians of the upper Amazon region have used gum curare on the tips of arrows, darts and spears to paralyze their game in hunting. Generalized muscular paralysis, respiratory failure and death occur within a few minutes after injection. The edibility of animals killed by so called Indian arrow poison is not affected. The secrets of curare preparation have been carefully guarded by the Indian witch doctors (curare makers) of the tribes and much mystery or "black magic" clouds its manufacture.

Crude gum curare is prepared by the natives by brewing the stems, bark, root and leaves of certain plants in water. The resultant infusion is strained and concentrated by boiling to a consistency adaptable to adhering to spear and blow gun dart points.

The first record of the primitive use of curare is in Hakluyt's description of Sir Walter Raleigh's contact with the Indians of the Orinoco plain in 1595. Alexander Humboldt (1859) first witnessed the manufacture of Indian made curare.

Sir Robert Schomburgh (1844) first named the plant group which enters into the making of the poison. He believed that animals hit by it died in convulsions similar to those produced by strychnine and named the plant strychnos toxifera. Consequently we find it listed in botany in the strychnine family despite the fact that pure curare is diametrically opposed to strychnine in action and is even an antidote for strychnine poisoning. Watterton and Brodie in 1815 demonstrated asphyxia to be the cause of death from curare poisoning.

Boussingault and Roulin, in 1824, first extracted the alkaloid curarin. Later, in 1864, Preyer isolated it in crystalline form. Claude Bernard, in 1844, first described the physiological action of the drug upon the neuromuscular junction and confirmed asphyxia as the cause of death. In 1849 he proved the drug harmless when administered by mouth. With M. Pelouze he reported a series of observations on experiments with animals: (1) The drug must enter the body by a wound to produce paralysis. (2) The action is upon the myoneural junction. (3) Sensory nerves and cardiovascular systems are relatively unaffected. (4) The drug does not injure muscle or nerve.

Thus, the drug became a useful tool for physiologic study. Lapique later found that curare lowered the excitability of muscle while leaving the excitability of nerve unimpaired. He showed that curarized muscle was still able to contract with vigorous stimulation, but the charges induced by the natural nerve impulse were too feeble to produce contraction.

Jousset, Demine and Busch in 1867 first attempted to apply the drug in clinical medical therapy. They treated convulsive states, epilepsy, rabies, chorea, strychnine poisoning and various tics. Hoffman, 1879, Hoche, 1894, and Cash, 1901, also experimented with curare. Tsocanakis, in 1923, tried curare in spastic paralysis. Bremer, in 1927, proved that the drug exhibited a selective action in reduction of local tetanus and decerebrate rigidity. West (1931-1935) and Cole (1934) reported partial results in relief of tetanus convulsions, relief of rigidity of Parkinsonism, causalgia, and spastic paraplegia. Burman (1938-1939) reported extensively upon its relaxing effect in spastic, athetoid, and dystonic states of muscular rigidity and tremor.

A great drawback to experimental and clinical investigation of the drug has been inaccurate information from native curare makers, because no gourd or tube of crude curare made by one witch doctor would duplicate the ingredients of another. Also, different curare plants from various areas give varying toxic action. Other lethal substances such as venom were added from time to time. These contaminants have snarled chemical and physiologic research. On the whole, the impression gained from pharmacologic literature is that the drug is highly toxic and dangerous, not applicable to clinical medicine. Furthermore, until recently, no large quantities of authenticated curare have been available at any one time for experimental research.

In 1934, Mr. Richard C. Gill, after exhaustive studies and prolonged contact with South American Indians, was able to learn the actual botanical ingredients and the secrets of manufacture. In 1938 he brought back to this country the largest amount of authentic and field tested curare ever gathered and brought back to the civilized world. In addition, he brought back a large amount of unauthenticated curare, that is, curare from regions he had not personally visited. This supply was turned over to the E. R. Squibb and Sons' research department.

Standardization of the Drug.

After considerable experimentation by Dr. A. R. McIntyre, professor of pharmacology at the University of Nebraska, and Mr. H. A. Holaday, head of the biological development and control division of Squibb's biological laboratories, working independently, the technic of standardization, at first difficult, has been simplified. Biologic methods of assay are necessary with each new batch of the drug. An aqueous infusion or hot alcoholic extract of the drug is prepared. The curare itself is extraordinarily stable, not destroyed by autoclaving. Assay by a variety of methods gives a result so precise that recheck reveals an error within the limit of one per cent.

Methods and Assay.—Curare-acetylcholine antagonism upon a frog gastrocnemius preparation has been applied. A frog gastrocnemius preparation is made which, with addition of acetylcholine produces an isometric type of contraction which furnishes a refer-

ence height for comparisons with a decreased height contraction obtained through the inhibiting effect of the curare solution.

Another method of assay is the head-drop method in the rabbit, developed by Holaday. The curare solution is injected slowly into the ear vein of the rabbit and the dose adjusted so that the neck muscles after two and one-half to three minutes reach a degree of flaccidity which just prevents the animal from raising the head and keeps the chin down. This end point is very clear-cut and a typical curare effect occurs exactly as seen in the human after injection of a curarizing dose. The amount per kilogram necessary to produce this effect in rabbits is estimated and the dosage is figured according to body weight of the patient. (See Fig. 1.)

Still another method, now abandoned, was to determine the lethal dose required for one-half of a certain number of mice. The estimated human dose was calculated by starting with one-sixth of the lethal dose for mice and finding the effective physiologic dose. The rabbit method is by far the best method in our experience.

Physiologic Action of Curare.

Action of pure curare is upon the neuromuscular mechanism. In certain impure preparations, another action is seen, ascribed by Burman[9] to curin. This side-effect is a histamine-like action producing sudden fall in blood pressure, bronchial spasm, facial pallor, erythema and urticaria; which are relieved by epinephrine. These preparations we have not employed clinically but are investigating them further. We believe them unsafe for clinical use.

The action of curare is upon the net-like structure of fine nerve fibers at the terminus called the motor end plate. It is here that acetylcholine, the chemical mediator or regulator of chronaxie of nerve impulses to voluntary muscle, acts. Curare prevents acetylcholine from acting on the nerve muscle junction and inhibits its action, thus producing a paresis of muscle. Curare poisoning (curarization) thus prevents the transmission of natural nerve impulses from motor nerves to the muscles. This peripheral motor flaccid paralysis affects nerve endings generally of all striated or voluntary musculature, but selectively affects first fine, fast-moving muscles of high chronaxie, such as short muscles of the eyes, and

throat, later, the larger, slower-moving muscles of head, neck, extremities, intercostals and diaphragm.

The circulation is relatively unaffected and sensory nerves are not affected. While reflexes may be somewhat diminished they are not abolished. Death occurs from asphyxia due to respiratory paralysis. The so-called lethal point of the drug is questionable because large doses are tolerated if respiration can be continued. The drug is quick acting and very rapidly eliminated. The rapidity of absorption has much to do with lethality. Small amounts of the drug injected rapidly are toxic and produce cardiac failure in animals while large amounts may be given slowly without toxic symptoms. Fifty times the lethal dose has been given to dogs by Dr. A. R. McIntyre without fatality by keeping up artificial respiration.

The physiologic effects are noted immediately at the end of an intravenous injection given over a period of one to two minutes. In about two more minutes the peak of curarization is reached, whereupon the effect slowly recedes and seems to vanish in fifteen to twenty minutes. The same effect occurs in fifteen to twenty minutes after intramuscular injection. Physiologic symptoms are seen in the following sequences: The patient first complains of haziness or fuzziness of vision. Next, bilateral ptosis appears with slight nystagmoid movements, relaxation of the face and heaviness, with relaxation of the jaws. The patient at this point complains of tightness of the throat and huskiness of the voice. Generalized heaviness and weakness of the neck muscles with inability to raise the head are followed by weakness to complete paresis of the spinal muscles, legs and arms. Last, appears shallowness of respiration from weakness of the intercostal and the diaphragm.

These symptoms follow the same order as the progressive symptoms of a patient with myasthenia gravis; double ptosis and nasal smile also simulate the myasthenic. Excess saliva may accumulate in the throat and the patient complain of difficulty in breathing, but this occurrence is counteracted considerably if the relaxed jaws and tongue are held forward. Injections of epinephrine, prostigmin or metrazol all seem to counteract quickly the action of curare. Burman [9] believes that a sustained, clinically relaxing effect upon hyperkinetic or spastic muscles remains for a long period of time after the toxic deacetylcholinizing effect of

curare has disappeared. We have not been convinced of any such prolonged action from curare. In fact this temporary effect is a drawback to its usefulness in spastic states. It is essentially a very transiently acting drug because of its rapid elimination.

There are a number of drugs known to have a curare-like action: quinine methochloride, erythroidine hydrochloride, ammonium bases, amides and amines, choline, muscarin, snake venoms, methyl strychnine, aromatic series, pyridin, quinolin, thallin, nicotine series, piperdin, putrefactive ptomains and products of muscular metabolism.

Curare, as yet, has not gained a definitely useful application in clinical medicine. Attempts have been made from time to time to apply the curarization principle in treatment of spasmodic disorders. West [11] and others have reported partial results in tetanus. The most encouraging recent report is that of Burman in infantile cerebral palsies, spastic pyramidal states, and extrapyramidal rigidity states which are associated with involuntary movements, athetosis and tremor.

After an extensive use upon spastic paralytic children, of carefully assayed products of aqueous and alcoholic extracts of crude curare prepared by Dr. A. R. McIntyre, I became convinced of the safety of the drug. Experiments begun at the Lincoln State Mental Hospital were soon extended to my private patients; for the past nine months,[10] I have not administered convulsive shock therapy without preliminary curarization.

Up to April 15, 1940, 74 patients were given 466 treatments in my private practice; 27 patients were given 163 treatments under my supervision at the State Hospital without experiencing accidents or complications with one exception (see Table III). At the present time we are using a concentrated aqueous extract of curare known as intocostrin, biologically assayed and prepared by E. R. Squibb and Sons.

Technic of Curarization Preliminary to Convulsive Shock Therapy.

An intravenous injection of an aqueous solution of intocostrin containing 10 mg. of active curare principle per cc. is given over a period of one to two minutes. It has been found that 1 cc.

curarizes 15 to 20 pounds of body weight. Females take less than males; older patients more than younger patients. After a few injections, this individual variation in dosage can be easily calculated. On an average, 5 to 8 cc. is needed for a 100 to 150 pound woman and 8 to 12 cc. for a 150 to 200 pound male. The speed of injection influences the dose necessary. With a rapid injection, curarization is accomplished with a smaller dose. At first we gave injections within three to five minutes; lately injections of smaller dosage have been given within one to two minutes, with perfect safety.

One to two minutes after the injection, physiologic curarization effect is seen as described above. When the patient is barely able to lift the head or legs, the peak reaction has occurred. About two minutes after the curare injection, the estimated convulsant dose of metrazol is given.

Since my preliminary report,[10] we have gained more confidence in the treatment and find that we no longer need take any precautions such as hyperextension or the use of tongue gag, recommended at first to prevent complications. By the time the patient regains consciousness, the effect of curare has disappeared. Metrazol seems to be at least partially antidotal in its action.

Although patients are not able to thrash about after administration of metrazol, they should be carefully watched for evidence of respiratory embarrassment until consciousness is fully regained. Ampoules of epinephrin and prostigmin should be available for injection as an antidote. If respiratory failure should occur, artificial respiration should be effective, since the excretion of the drug is rapid and the patient will spontaneously regain breathing power within a short time. It is doubtful whether respiratory failure need be feared unless too large a dose or too rapid an injection of curare is employed. The criterion to be followed is sufficient curare to paralyze the muscles of the neck and back—when the patient is unable to raise the head, sufficient motor paresis has been produced for metrazol to be given. Care must be used not to allow the patient's head to fall backwards as his neck muscles are powerless. Advice has been given to hold the relaxed jaw forward if the patient's tongue interferes with respiration. As experience is gained with the method, less curare is used. It is not necessary

to produce complete paresis of the neck or legs in order to soften the convulsive shock sufficiently to prevent fractures.

There is no increased tolerance to repeated doses of curare, nor are larger doses of metrazol required to induce a convulsion. However, to avoid failure, we usually give one-half to one cc. more metrazol than estimated, since the effect of curare may begin to wear off before a second metrazol injection can be given. If a sub-convulsive dose of metrazol is given, a one cc. larger dose than the original should be given as soon as possible before the curare effect disappears.

The patient's dread of treatment and postconvulsive discomfort is much less from combined curare-metrazol than from metrazol alone. The nursing problem is likewise simplified. Patients upon regaining consciousness have less nausea and headache and no muscular aching, thus eliminating much post-convulsive treatment, such as external heat or drugs for pain. Furthermore, other patients on the ward are less disturbed, because there are no remarks about severity or dreadfulness of shock treatment. Patients having had both methods much prefer the combined curare-metrazol procedure.

Figs. 2 and 3 show the contrast between a straight metrazol convulsion and a combined curare-metrazol seizure in the same patient, illustrating the remarkable diminution of muscular contraction.

Since the preliminary report [10] on the actual technic of this method, the demand for curare has been difficult to supply. Through the gratuity of E. R. Squibb and Sons, concentrated aqueous extract of curare (intocostrin) has been supplied to several leading psychiatric institutions: New York Psychiatric Institute and Hospital, under the direction of Drs. Nolan Lewis, E. Barrera and M. Harris; George Washington University, Dr. Walter Freeman; Philadelphia General Hospital, Dr. J. F. Stouffer; Sheppard & Enoch Pratt Hospital, Dr. L. F. Woolley; Colorado Psychopathic Hospital, Dr. F. G. Ebaugh; University of Wisconsin, Dr. Hans Reese; Menninger Clinic, Dr. William Menninger; Milwaukee Sanitarium, Dr. L. H. Ziegler; Neurological Institute, Dr. Paul Hoefer; Hartford Hospital, Dr. Ralph Tovell; The Tucker Sanatorium, Dr. Geo. S. Fultz, Jr.; Worcester

State Hospital, Dr. Erel L. Guidone; Longview Hospital, Dr. D. Goldman.

While we have had no subjective symptoms even suggestive of traumatic skeletal lesions, with one exception, since instituting combined curare-metrazol shock therapy, we have carried out a series of roentgenographic studies to ascertain if spinal lesions have occurred. In 26 consecutive patients we have x-rayed the vertebral columns before and after a series of curare-metrazol shocks and in only one of these patients have we been able to demonstrate any evidence of compressive fracture. In this case a compressive fracture of the 7th dorsal vertebra occurred. This accident occurred in the state hospital series (see Table III). Difficulty in injecting metrazol, because of the patient's poor veins, allowed the protective effect of the curare to wear off. Therefore the patient had a very hard seizure. In a few other patients compression fractures were found, the result of previous metrazol therapy.

We have been satisfied from clinical experience that the same therapeutic effectiveness occurs with the combined treatment as reported previously in affective disorders with straight metrazol shock therapy. This opinion was confirmed by brain wave studies made by W. E. Rahm, research assistant in neurophysiology, New York Psychiatric Institute, at a demonstration of the treatment at the Institute. The E. E. G. patterns made upon curarized patients subjected to metrazol shock therapy showed essentially the same pattern (see Fig. 4) as from metrazol alone. These findings simply corroborate the clinical observations that curare in no way influences the convulsive shock treatment except to lessen the severity of the spasmodic treatment and thus to eliminate the traumatic hazard.

In Table I the results obtained in affective disorders by metrazol treatment alone prior to curare therapy are listed.

In Table II we have evaluated the number of patients who have received in private practice at the Bishop Clarkson Memorial Hospital, combined curare and metrazol shock therapy; in Table III, those in the Lincoln State Hospital. These tables do not include experience with many spastic, athetoid, dystonic and hyperkinetic children and adult patients who have received curare treatments. In no institution, although the treatments have been ad-

ministered by a number of physicians, have any toxic accidents occurred from administration of curare.

An attempt was made to procure data from collaborating institutions carrying on studies with combined curare-metrazol therapy. In most instances the series of completed cases is still too small to draw useful conclusions.

Up to April 15, 1940, reports upon 21 patients who received 109 curare-metrazol shocks have been sent from the following institu-

TABLE I.

FROM SEPTEMBER 1937 TO SEPTEMBER 1939 (99 CASES—89 DEPRESSIVE AND 10 MANIC).

Diagnosis.	No. cases.	Results.*	Relapse.
All types of depressions	89	46 A	
		39 B	11 (1 suicide).
		4 C	
Manic excitement	10	5 A	
		4 B	2
		1 C	

* *Results:*

A—complete remission with full insight; return to former social level.
B—Social remission, able to adjust at home but with some residual symptoms, usually anxiety. Incomplete insight.
C—Unimproved.

Comment.—Of 89 depressed patients, 46, or 51 per cent, obtained a full remission lasting up to two years; 39, or 44 per cent, obtained a social recovery, but 11, or 12 per cent, relapsed requiring repeated treatment. Five of these were again improved to a good social level. Four patients, or 4 per cent, were unimproved by treatment. Five, or 50 per cent, of 10 manic states obtained a full clinical remission lasting up to two years. Four, or 40 per cent, obtained a social remission, but two relapsed, requiring state hospital commitment; one was unimproved.

We are unable to give accurately the percentage of traumatic spinal lesions in this series because routine radiographic studies were not made. We believe the incidence of traumatic spinal lesions was at least 25 per cent, judging by the frequency of subjective symptoms—mainly back pain. The incidence of extremity fractures was four, two femur and two humeri; and two dislocations.

tions: Philadelphia General Hospital, Dr. J. F. Stouffer; Sheppard & Enoch Pratt, Dr. L. F. Woolley; Milwaukee Sanitarium, Dr. L. H. Ziegler; and George Washington University, Dr. Walter Freeman. In general, these groups report the same good results in affective disorders with indifferent to poor results in schizophrenia. None observed any toxic symptoms from curare and no complications occurred.

The introduction of this improved method of therapy has enabled us to widen the scope of usefulness of convulsive shock therapy. We have had experience with a number of cases of depressive psychoses complicated by age factors or severe organic

TABLE II.

RESULTS OBTAINED IN 74 CASES BY COMBINED CURARE-METRAZOL SHOCK THERAPY (OCTOBER 1939–APRIL 15, 1940).

(A) AFFECTIVE DISORDERS—(52 DEPRESSIVE AND 6 MANIC STATES).

Diagnosis.	No. cases. Sex.	Age.	Duration of psychosis.	Average shocks.	Average hospital days.	Total curare-metrazol shocks.	* Results.	Remarks.
Reactive depression	10 4—F 6—M	19–76	2 wks.–5 yrs.	4.8	46.4	48	7—A 3—B	1—Relapse (recovered second course). 2—Had serious organic disease.
Manic depressive	29 18—F 11—M	21–77	2 mo.–5 yrs.	6.5	41.5	188	18—A 10—B 1—C	2—Had serious organic disease. 2—Did not finish treatment. 3—Treated as out-patients.
Involutional melancholia .	13 7—F 6—M	41–68	2 wks.–2 yrs. 5 over 1 yr.	6.3	48.6	82	6—A 7—B	2—Had serious organic disease.
Manic states	6 3—F 3—M	22–59	1 wk.–4 mo.	5.4	31.4	32	3—A 3—B	
Total	58	19–77	1 wk.–5 yrs.	5.7	41.9	350	34—A 23—B 1—C	29, 40%, were over 45 yrs. 17, 30%, were over 55 yrs. 8, 14%, were over 60 yrs. 4, 7%, were over 65 yrs.

B-SCHIZOPHRENIA AND PSYCHONEUROSES—(11 SCHIZOPHRENICS, 5 PSYCHONEUROSES).

Schizophrenia	11 6—F 5—M	16–52	5 da.–8 yrs.	8.5	60.6	93	1—A 6—B 4—C	2—Treated as out-patients.
	4—F 1—M		6 mo.–20 yrs.	5.5	49.5	23	1—A 2—B	2—Treated as out-patients.
Psychoneuroses.....	5	35–42					2—C	1—Discontinued treatment.

* *Results:*

A—Complete remission with full insight, return to former social level.
B—Social remission, able to adjust at home, but with some residual symptoms, usually anxiety.
C—Unimproved.

Comment on Entire Series.—74 patients received 466 curare-metrazol shocks. No complications occurred. Dosage of metrazol was from 4 to 10 cc. Three patients did not finish course of treatment; 7 patients were treated as out-patients.

to 10 cc. Three patients did not finish course of treatment; 7 patients were treated as out-patients.

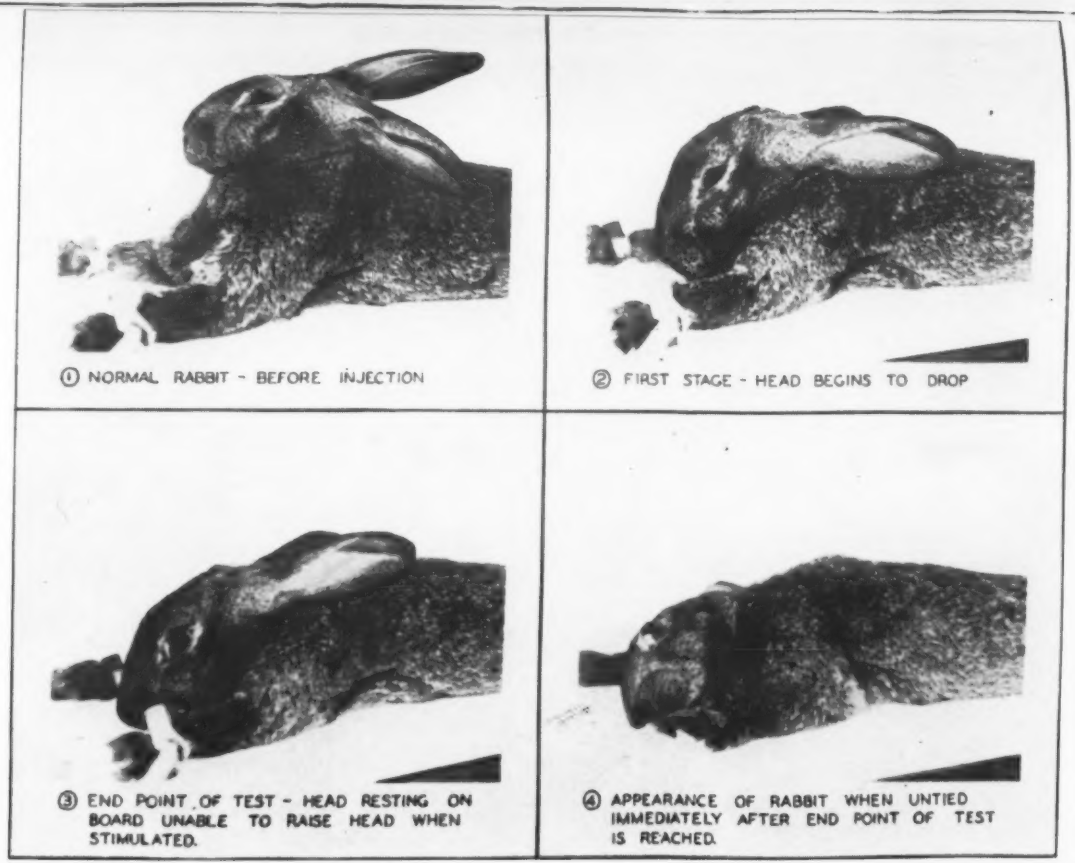

FIG. 1.—Bio-assay of curare.

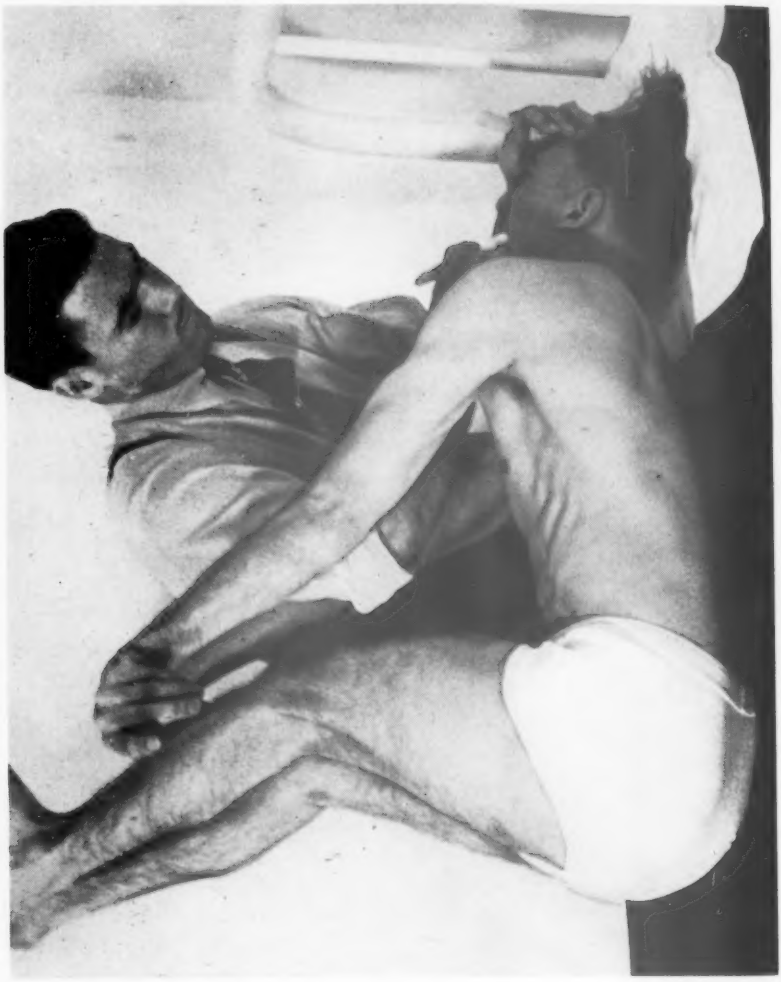

FIG. 2.—A straight unrestrained metrazol convulsion.

FIG. 2.—A straight unrestrained metrazol convulsion.

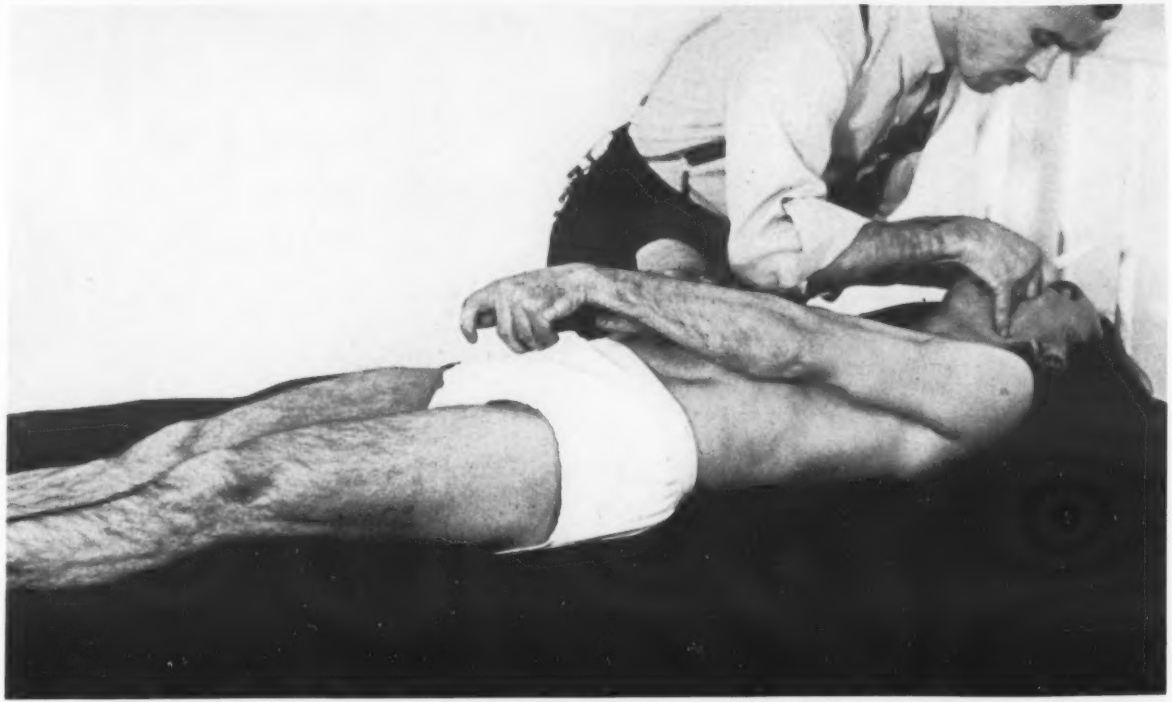

FIG. 3.—The same patient as shown in Fig. 2 after curarization followed by metrazol, illustrating the remarkable diminution of muscular contraction.

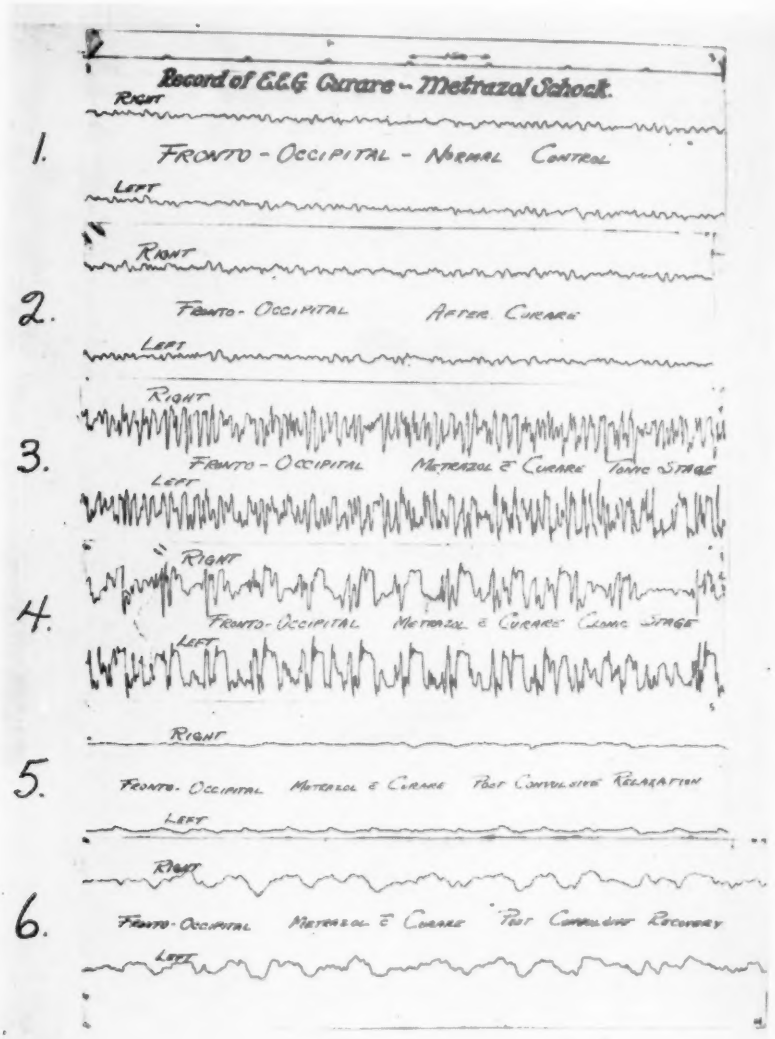

FIG. 4.—First tracing shows normal control record. Second tracing shows normal pattern persists after curare.

Third and fourth tracings show waves of increased frequency and high amplitude following metrazol.

Fifth tracing shows complete absence of rhythmic activity.

Sixth tracing shows slow waves of 2-3 per second that persist during confusional state.

disease. These cases are worthy of report to illustrate the safety of treatment and the recovery of patients who would never have been able to withstand metrazol shock therapy alone. In my opinion hardly any of these patients could have made spontaneous recoveries without this therapy. They are all socially well adjusted individuals at the present time.

TABLE III.

LINCOLN STATE HOSPITAL, LINCOLN, NEBRASKA.*

COMBINED CURARE-METRAZOL SHOCK THERAPY.

Diagnosis.	No. cases. Sex.	Age.	Average number shocks.	Total curare-metrazol shocks.	Results.	Complications.
Schizophrenia	21 8–F 13–M	17–53	6	139	3—A 7—B 11—C	One compression fracture of 7th dorsal. Metrazol given after curarization had worn off.
Depressions	5 3–F 2–M	53–62	5.4	27	4—B 1—C	
Manic	1–M	32	4	4	1—C	
Total	27	17–62	5.1	163	3—A 11—B 13—C	

Comment.—This series of chronic state hospital patients was treated with smaller amounts of curare given by a more rapid injection, obtaining a maximum effect within 1½ minutes after injection. X-rays were taken before and after treatment. One spinal fracture occurred after the curare effect had disappeared. Poor veins caused inability to give metrazol promptly. The dosage of metrazol varied from 5 cc. to 12 cc. Previously in this hospital, spinal fractures were frequent and a few extremity fractures occurred.

* Treatments in this series were carried out by Drs. R. W. Gray and G. W. Russell under the direction of Dr. A. H. Fechner, superintendent.

CASE HISTORIES OF UNUSUAL CASES HAVING RECEIVED CURARE-METRAZOL SHOCK TREATMENT.

CASE I.—Male, age 61, developed a severe reactive agitated depression following a diagnosis of rectal carcinoma and the first stage colostomy. This mental state made the second stage operation impossible. Radium was then applied to the tumor, a progressive weight loss of 25 pounds occurred, and during convalescence the patient fell in a bathroom and sustained compression fracture of the spine. He was referred for psychiatric treatment.

Physical examination revealed undernutrition, anemia and good functioning colostomy with a bleeding mass high up in the rectum. The mental reaction was a characteristic agitated depression with fearful hypochondriacal delusions: "Everyone talks about me; all the bones in my body are broken; I'm going to be drowned, dissected, or put away," he begged to "get it over with" and wished to end it all. There were no sensorium changes.

Progress.—Three weeks of symptomatic treatment—nutritional, sedative and anti-anemic vitamin therapy made no change in the physical or mental state. Then over a period of one month, nine combined curare-metrazol shocks were given. Steady sustained mental improvement progressed to complete recovery with a rapid gain of weight. Three weeks after the last shock treatment, the rectal carcinoma was removed by abdomino-perineal resection. Post-operative convalescence was uneventful and the patient resumed full occupation as a business executive six weeks after the operation.

CASE II.—Female, age 54, had been handicapped by posterolateral sclerosis from pernicious anemia for 15 years. Excellent management had kept the blood count at high level, but the patient's ataxia required the use of a cane. Fifteen years before, upon learning she had pernicious anemia, the patient had a reactive depression lasting two months. Following a strenuous year of teaching and a physical examination in July, 1939, when it was suggested she might have hypertension and Bright's disease from which her mother had died, the patient reacted at once with anxiety and depression. The patient was unable to resume college teaching the fall term of 1939.

Progress.—For three months, psychotherapeutic office treatment was given, but the depressive features became more marked; hypochondriacal fears of "constitutional diseases, insanity and incurability" with a persistent suicide drive continued. The economic problem was important, since the patient's source of livelihood would be gone unless teaching could be resumed by 1940. Convulsive shock therapy was advised. After five combined curare-metrazol shocks, the patient made a full and complete recovery and within five weeks after beginning treatment, she returned to full occupation as a college teacher.

CASE III.—Male, age 64, for six months had progressive weakness, weight loss and mental depression. He gave up work and self-accusatory delusions developed: He was a thief, people were coming to punish him. He shut himself from all contacts and threatened suicide. Observation in another institution revealed a 30 pound weight loss, arteriosclerosis and diabetes mellitus. He was referred for psychiatric treatment.

Progress.—The mental reaction was characterized by marked depression inactivity, attempts to seclude himself in dark places, at times mutism and other times restlessness with extreme apprehension. Three weeks of diabetic high caloric diet therapy with adequate insulin failed to produce a weight gain or influence the mental state. After six combined curare-metrazol shocks the patient gained 20 pounds and made a complete recovery. The diabetic condition was then readily controlled by protamine zinc insulin. This recovery was effected within a two months hospitalization period.

CASE IV.—Female, age 77, had had a previous reactive depression at 63 years of age, lasting a few weeks. Following the sudden death of her husband in August, 1939, the patient again became depressed, apprehensive, agitated, and uninterested. After four months she was hospitalized for treatment.

Progress.—Within five weeks, after seven combined curare-metrazol shocks, the patient made a full and complete recovery.

CASE V.—Male, aged 76, had suffered at age 72 a cerebral thrombosis with right sided involvement and aphasia. After several months he was able to be up in a wheel chair. For the past two years he had given up completely, was depressed, tearful, blamed his family for mistreatment and remained constantly in bed. He was admitted for psychiatric observation.

Examination showed a marked spastic right hemiplegia, motor aphasia, coronary artery disease and hypertension of 190/110. The mental reaction was that of extreme emotionalism, irritability, paranoidal ideas and a wish to die.

Progress.—Three combined curare-metrazol shocks were given for the purpose of removing the depressive features. The patient withstood these treatments without ill effect. Improvement in the mental attitude was so marked that the patient became ambulatory in a wheel chair and could be transferred to a nursing home for permanent custodial care.

COMMENT ON THE FIVE CASES.

The results obtained illustrate the increased safety of combined curare-metrazol therapy as shown by its successful use with Cases IV and V, ages 77 and 76. These aged patients would have been serious risks if treated by metrazol alone. The effect of the treatment upon patients II and III, with diabetes and pernicious anemia was extremely interesting, illustrating the fact that serious organic diseases do not influence the therapeutic effectiveness. I would not have had the courage to treat either patient with straight metrazol. Case I looked particularly hopeless because of the complication of rectal carcinoma, radiation sickness, and fractured vertebral column. The outcome here speaks for the extreme value of the therapy. I doubt if recovery, physical or mental, could have been accomplished by any other method.

SYNTHETIC CURARE.

The problem of collecting and preparing curare entails considerable difficulty, as already discussed. A synthetic preparation would be an important advance in therapy, especially if a sustained curare-like effect followed oral administration.

Quinine has been known for some time to have a curariform action as shown by its relaxing effect upon myotonia congenita and dystonia musculorum deformans. It also aggravates myasthenia

TABLE IV.

UNUSUAL CASES OF DEPRESSION COMPLICATED BY ORGANIC DISEASE.

Case.	Sex.	Age.	Organic disease.	Mental status.	Treatment.	Result.
1	M	61	Carcinoma (rectum). Colostomy—radiation sickness—compression fracture of the spine.	Reactive depression, making removal of carcinoma impossible.	Full mental recovery after 9 combined curare-metrazol shocks.	Carcinoma removed—able to return to full occupation as an executive.
2	F	54	Pernicious anemia, combined sclerosis of 14 yrs. duration. Patient ambulatory with cane.	Reactive depression.	Full recovery after five curare-metrazol shocks.	Resumed full occupation as college teacher.
3	M	64	Diabetes mellitus.	Severe agitated depression.	Full recovery after failure to improve on insulin. Recovery after 6 curare-metrazol shocks.	Returned to former social status.
4	F	77	Arteriosclerosis.	Reactive depression.	Full recovery after 7 curare-metrazol shocks.	Returned to former social status.
5	M	76	Right hemiplegia aphasia —coronary artery disease.	Severe agitated depression.	Three curare-metrazol shocks. Improved depressive reaction.	Able to be transferred to nursing home for custodial care.

Comment.—Five cases illustrate the increased safety of modified convulsive shock therapy by curare. All represent cases that would have been serious risks from straight metrazol; showing that this safer method enlarges the scope of usefulness of the therapy.

gravis symptoms. The commercially available quinine salts, however, have too weak a curare-like action to be useful in convulsive shock therapy. Prior to using curare I tried quinine sulphate, but could not demonstrate any reduction in severity of convulsions by its use.

King has shown that in curare there are certain tertiary ammonium bases. It has also been known that quaternary ammonium compounds formed by the addition of alkyl radicles to the nitrogen atom of the quinoline ring have a curare-like action. Dr. H. King [13] has prepared a synthetic compound called quinine methochloride, formed by the addition of a methyl group to the quinuclidine nucleus of the quinine molecule. Harvey [14] has shown that this drug has a strong curare-like action when administered either orally or parenterally.

Through the courtesy of E. R. Squibb and Sons' research department, I was furnished quinine methochloride for experimentation. An aqueous solution was prepared containing 18 mg. per cc. In spastic paralysis immediate complete curariform action was seen after intravenous injection with 10-15 mg. per kilo of weight. Prior to convulsive shock therapy a complete relaxation of body musculature was obtained in all patients with 7-10 mg. per kilo of weight similar to that seen under curare. This curare-like effect, dependent upon the amount of drug used, markedly reduced the severity of the convulsive seizure.

From our experience so far, with this drug, we believe it will adequately prevent traumatic complications of convulsive shock therapy. However, we are not as yet certain about its margin of safety. In some instances after the convulsion the period of apnea was prolonged, suggesting more respiratory embarrassment than seen from curare; artificial respiration and prostigmin were necessary to restore normal breathing. Following intravenous injection there was also a decided drop in blood pressure that we have not seen from curare unless it is injected too rapidly. By the end of the metrazol shock, however, the blood pressure was back to original or higher levels. Whether the action of the drug is a pure curare effect is still not settled. The quinine may have other side effects. The curare-like action from quinine methochloride is transient and wears off as rapidly as from straight curare. Because of the relative insolubility of the drug, larger volumes of solution have to be given.

Further experimentation will be necessary before the drug can be safely recommended; also, to ascertain whether the drug can be successfully used orally to diminish metrazol convulsive seizures.

Conclusions.

1. Convulsive shock therapy has proved most useful as a means of terminating chronic resistant affective psychoses.

2. The usefulness of this therapy has been restricted and has been in danger of abandonment because of the severity of the convulsive shock with the hazards of traumatic complications.

3. There is something fundamentally sound in the application of this therapy. The problem has been to eliminate the traumatic hazards.

4. Previous attempts to eliminate traumatic complications have not been successful.

5. The principle of preliminary curarization before induction of metrazol shock has proved successful in eliminating all traumatic hazards.

6. A uniform standardized curare preparation has now been perfected that is non-toxic in physiologic doses and has proved to be a safe treatment.

7. The physiologic and pharmacologic effects of the drug have been discussed. The technic of this combined therapy is described.

8. Roentgenographic evidence and electro-encephalographic evidence are presented to show that the curare protects from traumatic complications, yet leaves the therapeutic effectiveness of metrazol undisturbed.

9. The results of previous metrazol therapy in affective psychoses are compared with curare-metrazol results to show the same therapeutic results are obtained without complication. Other investigators have confirmed our results with this new treatment.

10. A series of cases of depressive psychoses complicated with severe organic diseases are shown that widen the scope of usefulness of this modified therapy. A number of cases can now be salvaged that formerly could not have taken the treatment.

11. Curare is "tailor made" as a "shock absorber" for convulsive shock therapy.

12. A synthetic curare-like drug, quinine methochloride, has been prepared that has been shown to have a strong curare-like action. After intravenous injection it produces effective motor paresis sufficient to prevent traumatic complications of convulsive shock therapy. Further experimentation will be necessary, however, to determine the safety factor, before its use can be recommended.

13. If a continued, sustained supply of pure curare or a safe synthetic curare-like drug can be obtained, it will soon be illegitimate to administer convulsive shock therapy without this safeguard against the all too frequent and serious traumatic accidents.

BIBLIOGRAPHY.

1. Meduna, Ladislaus: Versuche über die biologische Beeinflüssung des Ablaufes der Schizophrenie; Campher und Cardiazalkrampfe. Ztschr. f. d. ges. Neurol. u. Psychiat., 152: 253-262 (Feb. 19), 1935.
2. Bennett, A. E.: Convulsive shock therapy in chronic depressive psychoses, Bull. Menninger Clinic, 2: 97, 1938; Am. J. Med. Sci., 1936: 420 (Sept.), 1938.
3. Bennett, A. E.: Metrazol convulsive shock therapy in affective psychoses, Am. J. Med. Sci., 198: 695-701 (Nov.), 1939.
4. Bennett, A. E., Nielsen, J. C., Fechner, A. H., and Cash, P. T.: Combined artificial fever and chemotherapy in dementia paralytica. Arch. Phys. Therapy, 20: 620-627 (Oct.), 1939.
5. Carp, Louis: Fracture and dislocations by muscular violence, complication convulsions induced by metrazol for schizophrenia. Ann. of Surg., 110: 107-118 (July), 1939.
6. Polatin, Philip, Friedman, M. M., and Harris, M. M.: Vertebral fractures produced by metrazol induced convulsions, J. A. M. A., 112: 1684-1687 (April 29), 1939.
7. Hamsa, W. R., and Bennett, A. E.: Traumatic complications of convulsive shock therapy. J. A. M. A., 112: 2244-2246 (June 3), 1939.
8. Alexander, F. A. D., and Himwich, H. E.: Nitrogen inhalation therapy for schizophrenia. Am. J. Psychiat., 96: 3 (Nov.), 1939.
9. Burman, M. S.: Therapeutic use of curare and erythroidine hydrochloride for spastic and dystonic states. Arch. Neurol. and Psych., 41: 307-327 (Feb.), 1939.
10. West, Ranyard: The pharmacology and therapeutic action of curare and its constituents. Proc. Royal Med. Soc., London, 28: 565-578 (Jan. 8), 1935.
11. Bennett, A. E.: Preventing traumatic complications in convulsive shock therapy by curare, J. A. M. A., 114: 322-324 (Jan. 27), 1940.

12. Strauss, Hans, and Rahm, W. E. Jr.: The effect of metrazol injections on the electroencephalogram. Psychiat. Quart., 14: 43-48 (Jan.), 1940.
13. King, Dr. H.: Nature, 135: 469 (1935), quoted by Harvey, A. M.: The action of quinine methochloride on neuromuscular transmission. Bull. Johns Hopkins Hospital, LXVI: 52-59 (Jan.), 1940.
14. Harvey, A. M.: The action of quinine methochloride on neuromuscular transmission. Bull. Johns Hopkins Hospital, LXVI: 52-59 (Jan.), 1940.

SCHIZOPHRENIC PSYCHOSES.

Report of 100 Cases in the U. S. Army.

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It is of particular interest to study schizophrenic psychoses at the beginning of the disorder. Later, precipitating and other factors may become shrouded in obscurity and be elicited only with difficulty. In the military service all individuals are under strict supervision and any departure from accepted standards is easily observed. Consequently the 100 soldiers that comprise this study were admitted to the psychiatric service almost immediately after the development of unusual symptoms.

The Material.

The case histories were unselected and consisted of consecutive admissions, the only requirement being that of a diagnosis of schizophrenia. The soldiers were primarily from the Eastern coast states from New York to Florida. Eighty per cent were of Anglo-Saxon stock and about 20 per cent equally divided between those of Italian, Polish and Hebrew ancestry. Ten had had previous hospitalization for mental illness. Some 6 per cent showed a mental age of between 10 and 11 years, the others were at least of so-called normal intelligence. In the family history, definite insanity was present in 33 per cent for the group as a whole (uncle, aunt, grandparent, parent or sibling). The percentage of familial insanity was highest in the hebephrenic group (57 per cent), followed by the paranoid (33 per cent), unclassified (27 per cent), simple (25 per cent), and the catatonic groups (0 per cent).

Diagnosis, Age at Time of Admission to Hospital and Length of Service.

(See Table 1.)

Paranoid reactions were greater in number than all others combined, followed in order by hebephrenic, unclassified (or mixed), catatonic and simple types. The average age at time of admission varied from 21.9 years in the unclassified reactions, gradually in-

creasing in simple, catatonic and hebephrenic reactions, to an average of 26.8 years in the paranoid reactions. Stated in different terms, no individual in the unclassified or simple groups had reached the age of 30, only 2 of the catatonic and hebephrenic groups had

TABLE 1.

DIAGNOSIS, AVERAGE AGE OF THE DIAGNOSTIC GROUPS, AND LENGTH OF SERVICE IN THE U. S. ARMY.

Diagnosis.	No. of cases.	Average age at hospitalization.	No. of enlistments.
Paranoid	57	26.8	2.14
Hebephrenic	19	24.2	1.42
Catatonic	9	24.1	1.00
Simple	4	23.0	1.25
Unclassified	11	21.9	1.27
Total	100		

reached the early thirties; but in the paranoid group, 16 were in the early and late thirties and 1 had reached the age of 40. The number of enlistments, in general, paralleled the age groups with the exception that all catatonic reactions occurred during the first enlistment.

PRESENTING AND INITIAL SYMPTOMS.

The patients were admitted to the hospital for the following reasons:

1. Patient's own request for mental observation			4
2. Disorders of Acting			52
	Unusual or bizarre	40	
	Maniacal	9	
	Fugue states	3	
3. Disorders of Feeling			11
	Emotional instability	4	
	Depression	3	
	Depression with suicidal ideas	4	
4. Disorders of Thinking			21
	Mental confusion	1	
	Obvious delusions/hallucinations	20	
5. Miscellaneous			12
	Constitutional psychopathic state	5	
	Diarrhœa	2	
	Furunculosis	1	
	Loss of weight	1	
	Anxiety syndrome	3	
		Total...	100

In 70 per cent of the cases, the presence of a psychosis was obvious prior to admission to hospital, and the onset of symptoms was apparently abrupt. In another 22 per cent the presence of some form of mental disorder was suspected by the referring physician. In 4 per cent the patients themselves realized that a mental disorder was present and requested treatment for the same (none had had previous observation for mental disease). Other disorders than mental were the causes for admission in 4 per cent, and the psychosis was detected later.

In at least one instance a psycholeptic attack [1] initiated the symptoms. A few weeks of gradually mounting tension of unknown origin culminated in something suddenly "snapping" in the patient's head. A panic state of a few hours followed. There were delusions, hallucinations, anxiety, fear. Over a period of two weeks these and other symptoms gradually lessened and disappeared. In a second individual, there was no known tension, but the symptoms were initiated by the feeling of a "blow" in his head that "addled" his brains and a psychosis gradually developed over a period of a few weeks.

The Psychosis.

The patients were classified in the accepted types of paranoid, hebephrenic, catatonic, simple and unclassified (or mixed) groups. The criteria for diagnosis conformed to the standards as laid down in the Statistical Manual for the use of Hospitals for Mental Disease.

In describing a psychosis, the symptoms may be arbitrarily divided into the fields of *acting, feeling* and *thinking* [2] for purposes of brevity and clarity. In the following brief descriptions, this division has been utilized.

The paranoid reactions occurred more frequently than all other reactions combined, and included the individuals with the greatest length of service and the highest average age. The reaction was characterized by:

Acting: agitated,* hostile, suicidal behavior, aversion,[3] panic states,[4] and mild admixtures of catatonic and hebephrenic symptoms.

* All symptoms listed under acting, feeling and thinking were arranged in descending order of frequency.

Feeling: apprehension, suspiciousness, depression, with underlying apathy and other incongruous affects.

Thinking: usually a clear mental setting, but occasionally disordered thinking; * delusions of reference, persecution, influence, grandeur, self-accusation and others in smaller percentages; auditory hallucinations of a perverse erotic content.

The hebephrenic reaction was shown in 19 cases, and was characterized by:

Acting: silly, bizarre behavior, occasional agitation.

Feeling: apathy, incongruous affects, ambivalence, elation.

Thinking: vague, scattered disordered thinking; delusions of grandeur, reference, persecution, depersonalization, influence, hypochondria and self-accusation; auditory and visual hallucinations frequently amusing to the patient.

The unclassified reaction in 11 cases, contained varying mixtures of paranoid, hebephrenic and catatonic trends, with corresponding disordered thinking, delusions and hallucinations. The fact that the average age in the unclassified group is the lowest of all the groups, and the extent of the delusions and hallucinations is less than in other groups, points to a later differentiation of this group into one of the more usual classifications.

The catatonic reaction of 9 cases all occurred during the first enlistment period. The reaction was characterized by:

Acting: agitation, alternating with negativism and catalepsy.

Feeling: apathy, incongruity between the affect and thought content, suspiciousness, ambivalence.

* Disordered thinking consists of abnormal processes of thought not involving delusions and hallucinations. These abnormal processes of thought, described by Levin,[5] Muncie,[6] and others, consists of unusual or logically false thinking, fusion of abstract and concrete concepts, answers unrelated in content, two ideas accidentally connected in one thought, vagueness, the use of approximate words, neologisms, brevity, blocking, stereotyped thought, thought pressure (apparent psychomotor acceleration with disconnected thinking). Disordered thinking was most frequent in the unclassified group, followed in descending order by the hebephrenic, simple, catatonic and paranoid groups.

Thinking: disordered thinking, especially blocking; delusions of depersonalization, reference, persecution, influence and grandeur; auditory hallucinations and hallucinations involving body organs.

The simple reaction of 4 cases was characterized by:

Acting: lack of interest, occasional bizarre behavior.
Feeling: apathy and affect-rigidity.
Thinking: occasional involvement of primary thought processes to produce some form of disordered thinking.

Neurosis and Psychosis.

That a neurosis may merge into a psychosis,[7] co-exist with a psychosis, or that a psychosis may regress leaving a neurosis, has been demonstrated many times in these patients. Twenty-five per cent suffered from some form of neurosis for periods varying from one month to 5 years before the symptoms of a psychosis became apparent: an anxiety syndrome existed in 16 per cent, hysteria (convulsions, anesthesias, fugues) in 3 per cent, hypochondria in 5 per cent, and one patient suffered from anorexia nervosa. In two instances, hysterical symptoms co-existed with the psychosis: in one, gun-barrel vision and complete anesthesia below the neck, and in the other, gun-barrel vision alone. These hysterical symptoms were easily influenced by suggestion. In 5 per cent of the cases, the symptoms of a psychosis appeared only now and then (principally at night), and at other times apparently an anxiety syndrome or a hypochondria only was present. In another patient, not otherwise reported here, the initial symptom was a panic state, followed by a paranoid trend lasting some weeks, to be replaced by compulsive-obsessive phenomena (washing hands, counting words) which also disappeared. The entire train of events occupied several months and improvement took place as insight occurred into the clearly apparent latent homosexuality.

Etiological Factors.

A. Family Relationships.

As the only source of information was the patient, there was probably insufficient information obtained on which to base accurate

conclusions about family relationships. This was particularly true in the catatonic group where the inaccessibility of the patient prevented much cooperation. However, in 40 per cent of the group as a whole, strong family ties were discovered. In 28 or 46 per cent of the paranoid group, and in 9 or 45 per cent of the hebephrenic group, deep emotional ties were easily found. In the paranoid group, 10 per cent were strongly attached to the mother and 4 per cent to sisters, deep aversion to the mother was found in 8 per cent and to the father in 14 per cent. There were continuous family dissentions or broken homes in 13 per cent. In the hebephrenic group, over-attachment to the mother was found in 16 per cent, aversion to the father in 20 per cent, and unhappy or broken homes in 9 per cent. The unclassified and catatonic groups contained 3 or 3 per cent of the total such factors: a mother attachment in one, aversion to the father in the second, and a broken home in the third.

B. PRE-PSYCHOTIC PERSONALITY.

(See Table 2.)

The pre-psychotic personality was determined by the life-long history, the information derived from associates, and the patient's responses to questions concerning specific traits.

TABLE 2.

THE PRE-PSYCHOTIC PERSONALITY

Diagnosis.	No.	Syntonic.	Schizoid.	Psychopathic.	Neurotic.	Anal.	Oral.
Paranoid	57	10	31	14	2	..	..
Hebephrenic	19	9	7	2	..	..	1
Catatonic	9	4	5	..	..	..	..
Simple	4	2	2	..	..	..	..
Unclassified	11	3	6	..	1	1	..
Totals	100	28	51	16	3	1	1

A schizoid form of personality was considered to consist of a preponderance of the following traits: of being solitary, asocial shy, sensitive, quiet, retiring, close-mouthed, bashful, irritable, moody, nomadic, non-athletic, of having few friends, a distaste for group activities, a tendency to reverie, a feeling of inferiority. This

type of personality was found in all groups and in 51 per cent of the total number of cases, but predominantly in the paranoid classification.

The psychopathic personality was considered to contain most of the following traits:

Acting: Frequent change (nomadism, inability to withstand tedium).

Social delinquency (conflicts with law and order, recidivism, lack of amenability to correction or discipline).

Sexual delinquency (extreme promiscuity, perversion).

Drug addiction (alcoholism, narcotic addiction).

Feeling: Egocentrism (exaggerating, dominating, pouting, criticizing, monopolizing, minimizing).

Callousness (lack of or superficial remorse).

Hair-trigger emotions (exaggerated display, irritability, impulsiveness, lability).

Inconsistent worry (worries but takes no steps to correct the situation).

Thinking: Hedonism (living on the principle that pleasure is the chief goal in life).

Lack of a sense of responsibility (improvidence, heedlessness, untrustworthiness, but little thought for the future, persistent falsification).

Lack of judgment (ability to realize consequences intellectually but not to evaluate them, great risks for immediate gains, inability to profit by experience).

Rationalization (projection of the blame for failure to others).

Such a personality type was found in 16 per cent of all cases, 14 per cent in paranoid and 2 per cent in the hebephrenic groupings.

The neurotic personality was considered to contain a history of nail-biting, enuresis, somnambulisms, night-mares or temper tantrums; also, the traits of self-display, abnormal sensitivity, freely and excessively discussing personal worries and problems, ennui to matters other than those of self, and of generally following the path of least resistance. This personality type was found twice in the paranoid group and once in the unclassified group.

Oral [8] (optimistic, ambitious, generous, sympathetic, talkative, temperamental, industrious, having a feeling of superiority; and anal [9] (orderly, punctual, conscientious, thorough, fastidious, saving, competent, reliable; or obstinate, irritable, meticulous, domineering, procrastinating, negligent, careless, wasteful) types of personalities were found in only two instances, once in the hebephrenic and once in the unclassified group.

Numerically, the syntonic or normally integrated personality was somewhat greater than it should have been, for, when there was little data to definitely classify the individual as an abnormal personality type, he was placed in the syntonic group. Doubtless some of these individuals would prove to have schizoid or other personalities if additional information could have been obtained. The syntonic personality constituted 28 per cent of the whole.

Various other types of personalities, such as cycloid, rigid or psychasthenic, were not seen in these patients.

C. PRECIPITATING FACTORS.

1. *Remote.*

Remote factors contributing to the development of a psychosis were considered to be those undesirable traits present but apparently not causing immediate concern to the patient. Among such undesirable traits were the following:

Autoeroticism was found 29 times; in the paranoid group 18 times, in the hebephrenic 8, in the catatonic 2 and in the unclassified once.

Hostility to the environment, consisting of dislike of the country, the army or associates, was found 6 times in the paranoid group and once each in the simple and unclassified groups.

Perverse sexuality occurred 6 times, all in the paranoid group.

Alcoholism, more or less chronic in nature, occurred in the background of 4 paranoid individuals.

Impotence and extreme heterosexual promiscuity each occurred once in the paranoid reactions.

Homesickness seemed to play a part in the development of the psychosis of one hebephrenic individual.

In all, possibly some 50 latent factors, of which 37 were sexual, were elicited in 100 psychotic individuals.

2. Immediate.

Unusual events occurring just prior to the development of an acute psychosis, or long continued brooding upon a subject, were considered to be definite precipitating factors. Such plausible causes were found in 45 per cent of all cases.

Perverse sexuality was the most common immediate factor. Acts of homosexual or heterosexual perversion frequently preceded the acute symptoms by a matter of days. In others, the acts occurred months or years before, and the patient had brooded over his misbehavior. This factor was found 9 times in paranoid individuals and twice in the unclassified group.

Alcohol seemed to precipitate the psychosis 5 times, once in a hebephrenic and 4 times in paranoid individuals. The symptoms were not characteristic of an alcoholic psychosis, and the presence of an affective state, typical of schizophrenia, confirmed the impression.

Homesickness was given as the cause 3 times, once each in the simple, hebephrenic and unclassified reactions.

Venereal disease. The onset of symptoms of a venereal disease preceded and almost coincided with the psychosis 3 times, twice in paranoid trends and once in catatonia.

Incestuous desires. Once in hebephrenia and twice in paranoid reactions, the presence of a sexual attraction to a sister was found. Still another paranoid individual wrote an extremely vulgar letter to his sister when he was drunk. A catatonic patient had erotic dreams of his little sister riding on his shoulder and rubbing his genitalia with her foot.

Overwork as a factor was found once each in hebephrenic and unclassified groups.

Other conditions found once each as precipitating factors in paranoid reactions were: worry over the world's economic ills, worry over fraudulent enlistment, fear of failure, insecurity, a proctoscopic examination, a chemical prophylactic for the prevention of venereal disease, and failure on attempted sexual intercourse. In one instance a cystoscopic examination was followed by a catatonic reaction.

SUMMARY OF PRECIPITATING FACTORS IN REGARD TO SEXUALITY.

Paranoid group: 33 of 57 individuals, or 58 per cent, showed abnormal sexual drives. Definite perversion was found in 15 or 28 per cent.

Hebephrenic group: 9 of 19, or 47 per cent, were associated with abnormal sexuality. 8 of the 9 were reversions to or a persistence of adolescent autoeroticism. One was concerned with the sexual attractions of a sister.

Catatonic group: 4 of 9, or 44 per cent, contained sexual factors. Two were autoerotic, venereal disease and impotence serving as precipitating factors in two more. A cystoscopic examination precipitated the psychosis in a 5th individual considered to be suffering primarily from an anxiety syndrome.

Simple group: No abnormal sexuality.

Unclassified group: 4 of 11, or 36 per cent, showed abnormal sexuality. Two were autoerotic, and perverse acts precipitated the psychosis in two more.

The presence of abnormal sexuality in 50 per cent of the group as a whole would indicate more than a coincidental relationship. Of course, regression from normal adult relationships may occur with a psychosis, or a latent psychosis may prevent normal sexual relationship. However, in 9 instances, the performance of a perverse act was followed by the appearance of acute symptoms, and this in itself is suggestive.

TEMPORARY COURSE.

These 100 patients were kept under observation a matter of days and weeks rather than months, and then transferred to other institutions. During this period, a total of 30 per cent improved to the point where delusions and hallucinations were not elicited and the mental state was clear. The greatest percentage of improvement took place in the paranoid group, namely 44 per cent. In two instances the regression of the delusional trend occurred abruptly following the remembering of forgotten sexual experiences. This remembering was associated with a definite emotional upheaval: inability to speak, tears, blushing, rapid pulse and respiration, trembling and sweating. Improvement also occurred in 28 per cent of the unclassified group, and in 10 per cent of the hebephrenic

group. No marked improvement occurred in any of the catatonic group, due probably to the short period of observation and treatment. The high percentage of remissions in paranoid reactions might indicate that many individuals have psychotic episodes of a paranoid nature, and do not become candidates for institutions until repeated attacks more or less fix the syndrome, The improvement did not seem to be correlated with the pre-psychotic personality type.

Summary.

1. 100 schizophrenic reactions in soldiers were studied immediately after the onset of psychotic symptoms.

2. Paranoid reactions occurred more frequently than all other reactions combined, followed in order by hebephrenic, unclassified or mixed, catatonic and simple types.

3. The average age on hospitalization was highest in the paranoid group, followed by hebephrenic, catatonic, simple and unclassified reactions.

4. The average length of service in the army was greatest in the paranoid reactions and least in the catatonic.

5. In 92 per cent, an obvious mental disorder in the individual resulted in psychiatric study. In 4 per cent the patients themselves requested psychiatric aid; and in 4 per cent a psychosis was undetected before admission to the hospital for other causes.

6. In 25 per cent of all cases, the outspoken psychotic symptoms were preceded by neurotic symptoms of one month to 5 years duration. A psycholeptic attack initiated symptoms in two individuals.

7. Neurotic symptoms merged into psychotic symptoms, coexisted with psychotic symptoms, or remained as residuae after the regression of psychotic symptoms.

8. Strong family ties existed in 40 per cent of the group as a whole, and consisted of deep attachments or aversions to parents or siblings.

9. Prepsychotic schizoid personalities were most common, followed in order by syntonic, psychopathic and neurotic personalities. Oral and anal types of personality each occurred once.

10. Apparent precipitating factors, both latent and immediate, involved abnormal sexuality in 50 per cent, hostility to the environ-

ment in 13 per cent, alcohol in 9 per cent and homesickness in 4 per cent.

11. Rapid improvement occurred in 44 per cent of the paranoid reactions, in 28 per cent of the unclassified or mixed reactions, in 10 per cent of the hebephrenic, and no improvement occurred in any of the catatonic reactions during the short period of observation.

Conclusions.

1. The cause of schizophrenic psychoses in the United States Army is not found in any peculiar of particular demands of the service. However, the change from a familiar to an unfamiliar environment, with added stresses and strains, probably plays a part in bringing latent trends to the surface.

2. Abnormal sexual drives, to a large degree, are associated with the development of the psychoses, and probably act as precipitating factors.

3. The apparent psychotic symptoms are usually abrupt in onset, frequently not well defined, and may be somewhat transient in nature.

BIBLIOGRAPHY.

1. Muncie, Wendell: The psycholeptic attack in the psychoses. Arch. Neurol. & Psychiat., 27: 352 (Feb.) 1932.
2. Odom, C. C.: Unpublished data.
3. Diethelm, Oskar: Aversion and negativism. Arch. Neurol. & Psychiat., 37: 805 (April) 1937.
4. Diethelm, Oskar: The nosological position of panic reactions. Am. J. Psychiat., 13: 1295 (May) 1934.
5. Levin, Max: The basic symptoms of schizophrenia. Am. J. Psychiat. 11: 215 (Sept.) 1931.
6. Muncie, Wendell: Psychology of metaphor. Arch. Neurol. & Psychiat., 37: 796 (April) 1937).
7. Myerson, Abraham: Neuroses and neuropsychoses. Am. J. Psychiat., 94: 961 (Jan.) 1938.
8. Abraham, Karl: Selected papers of Hogarth Press, 1927.
9. Jones, Ernest: Psychoanalysis. Wm. Wood & Co., 1938.

REGRESSION NEUROSES AND SCHIZOPHRENIA.

An Analysis of Forty Cases in University Students.

By ANNETTE C. WASHBURNE, M. D.,*

AND

EDWARD R. HODGSON, M. D.

I.

The term regression covers a number of clinical entities whose inter-relationship is vague. Indeed the psychodynamism itself while definable is difficult to evaluate; however its frequent occurrence and potential malignancy furnish valid reasons for continued investigation.

For practical purposes regression may be viewed as a retreat of the reactional and affective forces toward more primitive levels of behavior. The individual manifesting such tendencies reverts to a point where he may experience some feeling of safety. Here, consciousness of failure, frustration and weariness with the struggle for adjustment become less acute. Progress which was painful is eliminated and replaced by a type of narcisstic nirvana whose outward expressions are demonstrated in various symptom complexes. Viewed in this manner it is possible to trace through 3 descending levels the *emotional withdrawals* of depression, stupor and suicide. *Socially,* attitudes decline from unsocial ones to those which are antisocial and asocial. *Psychosomatically* one finds varying narcisstic patterns, somatic illusions, feelings of unreality, delusions and hallucinations. *Clinically* one may "label" regressive phenomena as (1) schizoid personality types, (2) regression neuroses, (3) depression states, and (4) schizophrenia.

Because these conditions represent different stages of regression, the question has been raised whether or not a syndrome such as a regression neurosis antedates and in some instances actually merges into schizophrenia. W. R. Miller [1] has called attention to the psychoneurotic reactions which occasionally precede the

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development of schizophrenia and D. E. Cameron [2] in discussing Dr. Miller's paper stressed the importance of further study of these prodromal neuroses. Since our knowledge of schizophrenia is still inadequate, the difficulties in its early diagnosis are obvious. The determination of a possible merging period between a regression neurosis and a schizophrenia is similar to a study in delicately shifting pastels, with the answer in each case largely dependent upon the intuition, idiosyncrasies and clinical experience of the observer. If one attempts a more objective evaluation of this neurotic-psychotic overlap, there remains the well trodden path of symptom observation. To be of value, however, this implies (1) an initial understanding of what is included under the symptom terms employed by the observer, and (2) a determination of the presence or absence of similarly understood symptoms in other patients displaying the same mechanisms. That *interpretations* of symptom significance will continue to vary, seems to us of less importance than the continued need for careful observation of the symptoms themselves. Having these points in mind we began this survey with two questions:

I. What are the symptoms and signs most common to regression neuroses in general?

II. Is there any preponderance or re-emphasis of certain of these symptoms and signs in schizophrenia?

During a 3-year period we have seen 2404 university students presenting neuropsychiatric complaints. From this number we have selected for the present study 10 cases of schizophrenia and 30 cases of schizoid personalities demonstrating regressive phenomena. These patients were chosen from a larger "regressive group" because they appeared to us to be most representative. The 10 cases of schizophrenia are briefly summarized as follows:

A. *Sex.* 7 males, 3 females.

B. *Age.* Youngest, 19 years; oldest, 32 years; average, 23.7 years.

C. *Type.* Paranoid, 4 cases; catatonic, 2 cases; hebephrenic, 2 cases; mixed, 2 cases.

D. *Criteria for diagnosis.* Extensive regressive signs and symptoms, including 2 cases of catatonic stupor and 6 cases showing delusions and hallucinations. (In the 4 paranoid patients the delusions were typical.)

E. *Eventual outcome.* After observation, numerous interviews and examinations, 7 patients were placed in mental institutions on a commitment basis. At the present time (July, 1940) 6 are still there, the seventh having died

suddenly of right heart failure in an institution. The eighth patient was sent home to be under the care of a local psychiatrist, the ninth patient was admitted to a private sanitarium for insulin therapy (with marked improvement), and the tenth is still ambulatory.

The 30 cases of regression neuroses consisted of 23 males and 7 females. All were felt to have inadequate personalities of a schizoid type and all showed evidences of regression though not to a psychotic level.

The case histories on these 40 patients were reviewed with the questions mentioned above in mind. Because of the limited number of cases, generalities or attempts to draw conclusions are out of order.

Despite the scarcity in numbers, however, we have been encouraged to begin the survey because (1) all the patients were students, (2) all of a relatively equal age, (3) all living under somewhat similar circumstances, (4) all exposed to the scholastic requirements of the university, and (5) all patients were readily available for numerous interviews, physical and laboratory examinations.

II.

Symptoms and Signs Among 40 Cases.

(For convenience in discussion we may regroup these under 2 headings.)

I. Symptoms and signs *having* regressive significance.
II. Symptoms and signs *lacking* regressive significance.

I. *Symptoms and signs having regressive significance.*

A. *Emotional withdrawals.* In the order of *descendancy* (to deeper regressive levels) these included:

1. Benign depressions, reactive in nature,
2. Depressions of an affective type,
3. Catatonic stupor,
4. Suicidal attempts or threats. (There was no instance of successful suicide in this group.)

B. *Social attitudes.* Three degrees of unsuccessful social attitudes were considered.

1. Unsocial—the individual *neither* seeking nor avoiding companionship.
2. Antisocial—the individual *avoiding* companionship.

3. Asocial—the individual *resisting* companionship. (In 3 cases this resistance was active, the patients showing actual opposition to all attempts at establishing social rapport; in 2 cases the resistance was passive being associated with stupor.)

C. *Psychosexual immaturity.*

1. Narcisstic manifestations included 1 case of Œdipus complex and 26 cases of narcisstic behavior levels. A number of these were chronic masturbators. (Because of the relatively high frequency of this latter phenomenon we considered it significant only if practised to excess or when accompanied by marked feelings of guilt.)
2. Homosexuality. Overt homosexuality was considered a definite factor in 4 cases and latent homosexual tendencies of significance in 2.

D. *Psycho-somatic manifestations.*

1. Somatic illusions. Unfixed ideas, usually fluctuating in pattern and intensity were present in 9 cases. These included concepts of somatic pathology or altered physical appearance. In no instance did these ideas persist.
2. Feelings of unreality. These were noted in 21 cases. (The importance of this symptom has been noted frequently. In 1939 it was suggested by one of us, A. C. W.,[3] that a failure in displacement might be considered as one etiological factor. A review of these cases indicates that in 16 instances unreality feelings developed after progress toward a primary objective was blocked.)
3. Delusions and hallucinations were present in 6 of the 10 schizophrenics.

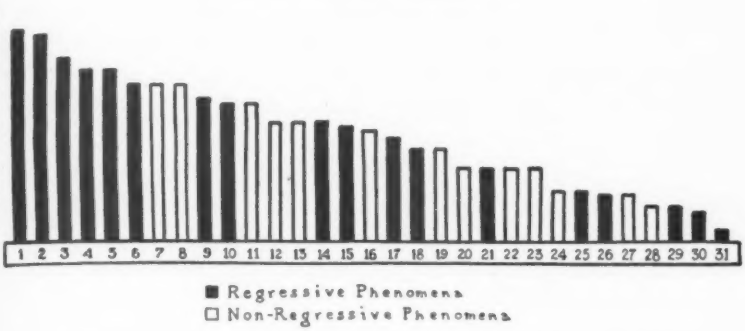
E. *Personality traits.*

In an article entitled "The Prepsychotic Personality of Patients With Agitated Depressions" Titley[4] enumerates various symp-

toms. As many of these suggest a regressive mechanism, we have selected 7 for particular consideration in this survey. These include sensitiveness, anxiety, narrow interests, rigid personality, difficulty in adjusting to change,

CHART I.

FREQUENCY OF OCCURRENCE OF SYMPTOMS AND SIGNS IN BOTH REGRESSION NEUROSES AND SCHIZOPHRENIAS.



1. Sensitiveness.
2. Anxiety.
3. Narrow interests.
4. Benign reactive depression.
5. Unsocial attitudes.
6. Narcisstic-homosexual tendencies.
7. Poor design for living.
8. Good physical health.
9. Rigid personality.
10. Change difficult.
11. Adequate funds.
12. Adequate school work.
13. No insight.
14. Feelings of unreality.
15. Affective depression.
16. Inadequate school work.
17. Antisocial attitudes.
18. Overconscientiousness.
19. Inadequate funds.
20. Therapeutic insight.
21. Intolerance.
22. Poor physical health.
23. Fair design for living.
24. Phobias.
25. Somatic illusions.
26. Suicidal threats.
27. Compulsions.
28. Good insight.
29. Delusions and hallucinations.
30. Asocial attitudes.
31. Stupor.

overconscientiousness and intolerance. In our patients they occurred most frequently in the order given; in fact, the first 3, sensitivity, anxiety and narrow interests, led all the other symptoms (see Chart I).

In order to avoid confusion we have extended these terms to cover the following symptoms: *sensitiveness,* to include the vari-

ous manifestations of self-consciousness; *anxiety,* to extend from apprehension to panic states; *narrow interests,* a restriction of outlook to one or two spheres; *rigid personality,* "unbending" traits making adjustment to shifting objective factors difficult without self damage; *difficulty in adjusting to change,* determined in this group by personality complications in meeting the new environment imposed by the university; *over-conscientiousness,* including over-attention to self or work involving scrupulous behavior; *intolerance,* manifested by dogmatic inflexible attitudes toward self or others.

These 18 regressive symptoms are shown in solid black on all 3 charts and will be discussed in more detail later.

II. *Symptoms and signs lacking regressive significance.*

A. Measurable objective factors capable of producing symptoms and signs.

1. *Money.* Where the patient had sufficient finances to preclude this as a causative or contributory factor the term "adequate funds" was employed. "Inadequate funds" was applied to those individuals to whom the lack of money was felt to be a contributing factor.
2. *School work.* This referred to the ability of the student to satisfy university scholastic requirements. Where this was done it was labelled "adequate work." Where the student showed poor to failing grades it was termed "inadequate work."
3. *Health.* In an endeavor to trace possible relationships between physical health and regressive patterns the cases were reviewed with this in mind. Twenty-seven of the total 40 (7 schizophrenics and 20 regression neuroses) had no demonstrable organic pathology. The other 13 (3 schizophrenics and 10 regression

neuroses) had physical difficulties which we considered contributory. These included:

2 cases of marked speech defects, 1 being further complicated by extreme height and acne vulgaris.
1 malnutrition.
2 neurocirculatory asthenia complexes.
3 endocrine dysfunctions.
1 severe bronchitis.
1 Sydenham's chorea,
1 bronchopneumonia.
1 anginoid attacks.
1 unexplained fever of two weeks duration.

4. *Design for living.* Under this heading we considered (1) the patient's ability to have in mind a reasonable goal or objective, (2) the patient's development of practical methods to reach this goal. If these requirements were fulfilled the term "fair design for living" was used and where one or both requirements were lacking it was labelled "poor design for living."
5. *Insight.* The ability of the patient to understand his illness in a constructive manner was termed "good insight." Where such ability was developed under therapy it was called "therapeutic insight." Where no insight was originally present *or* could not be developed under therapy it was termed "no insight."
6. *Other factors.* Phobias and compulsions were present in eight and nine cases respectively. The terms were used with their accepted meaning.

Because we were unable to visit the homes of these students, or, except in a few instances, to establish contact with the family, evalution of the hereditary home environment factors was omitted from this study.

III.

In an endeavor to visualize our results 3 charts were prepared. In all of these the frequency with which symptoms and signs

occurred was estimated in terms of percentage and shown by columns of appropriate height. The identity of each is indicated by numbers as follows:

1. Sensitiveness.
2. Anxiety.
3. Narrow interests.
4. Benign reactive depression.
5. Unsocial attitudes.
6. Narcisstic-homosexual tendencies.
7. Poor design for living.
8. Good physical health.
9. Rigid personality.
10. Change difficult.
11. Adequate funds.
12. Adequate school work.
13. No insight.
14. Feelings of unreality.
15. Affective depression.
16. Inadequate school work.
17. Antisocial attitudes.
18. Overconscientiousness.
19. Inadequate funds.
20. Therapeutic insight.
21. Intolerance.
22. Poor physical health.
23. Fair design for living.
24. Phobias.
25. Somatic illusions.
26. Suicidal threats.
27. Compulsions.
28. Good insight.
29. Delusions and hallucinations.
30. Asocial attitudes.
31. Stupor.

More specifically: Chart I represents the frequency of occurrence of all symptoms and signs in the entire group, both neurotic and psychotic. Estimates in percentages were compiled on the basis of 40 (the total number of patients). It is of interest that the first 6 symptoms and signs in order of frequency are regressive.

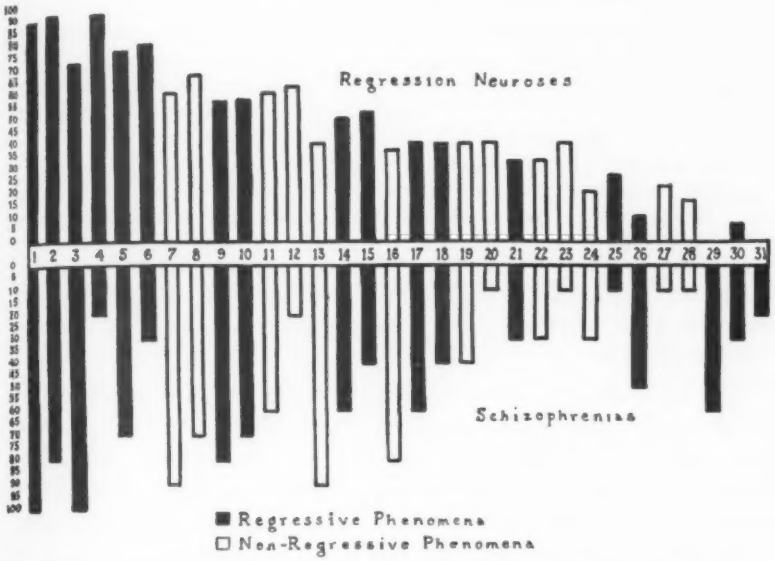
In Chart II an effort was made to compare the frequency of occurrence of symptoms and signs in the neuroses as *compared* to the schizophrenias. Because of the numerical difference in the 2 groups (30 neurotics and 10 psychotics), percentage estimates based on the total of each, were compiled separately in order to provide a more accurate comparison of the two. The results shown in this chart may be summarized as follows:

If we assume that variations in frequency of *less* than 20 per cent are insignificant the following 16 symptoms and signs were felt to be of *little* or *no* diagnostic aid:

1. Sensitiveness.
2. Anxiety.
5. Unsocial attitudes.
8. Good physical health.
10. Change difficult.
11. Adequate funds.
14. Feelings of unreality.
15. Affective depression.
18. Overconscientiousness.
19. Meager funds.
21. Intolerance.
22. Poor physical health.
24. Phobias.
25. Somatic illusions.
27. Compulsions.
28. Good insight.

CHART II.

FREQUENCY OF OCCURRENCE OF SYMPTOMS AND SIGNS IN REGRESSION NEUROSES AS COMPARED TO SCHIZOPHRENIAS.



1. Sensitiveness.
2. Anxiety.
3. Narrow interests.
4. Benign reactive depression.
5. Unsocial attitudes.
6. Narcisstic-homosexual tendencies.
7. Poor design for living.
8. Good physical health.
9. Rigid personality.
10. Change difficult.
11. Adequate funds.
12. Adequate school work.
13. No insight.
14. Feelings of unreality.
15. Affective depression.
16. Inadequate school work.
17. Antisocial attitudes.
18. Overconscientiousness.
19. Inadequate funds.
20. Therapeutic insight.
21. Intolerance.
22. Poor physical health.
23. Fair design for living.
24. Phobias.
25. Somatic illusions.
26. Suicidal threats.
27. Compulsions.
28. Good insight.
29. Delusions and hallucinations.
30. Asocial attitudes.
31. Stupor.

Using the original grouping of symptoms and signs the above 16 signs and symptoms may be reviewed as follows:

Regressive Manifestations:

1. *Emotional withdrawal*—affective depression (No. 15).
2. *Social attitudes*—unsocial (No. 5).
3. *Pychosexual immaturity*—none.
4. *Psychosomatic manifestations*—somatic illusions (No. 25) and feelings of unreality (No. 14).
5. *Personality traits*—sensitiveness (No. 1), anxiety (No. 2), change difficult (No. 10), overconscientiousness (No. 18), intolerance (No. 21).

Non-Regressive Manifestations:

The presence of good or poor health (Nos. 8-22), of adequate or inadequate funds (Nos. 11-19), of good insight (No. 28), or of phobias and compulsions (Nos. 24-27) seemed of indefinite significance.

It was felt that the 9 regressive manifestations listed above were representative of regression states in general and lacked diagnostic significance here.

In Chart III we considered the 15 symptoms and signs which predominated in one or the other group by *20 per cent or more.* To simplify the findings these were charted *only* in the group where they predominated, the percentage occurrence in the other group having been subtracted. (Thus, benign affective depressions (No. 4), were originally present in 93 per cent of the neurotics and in 20 per cent of the psychotics. As the neurotics predominated, the symptom was placed in that group at 73 per cent.) Worked out in this fashion 5 symptoms and signs, 2 of them regressive, predominated in the neurotics. In the order of frequency they were:

No. 4 benign affective depressions.
No. 6 narcisstic-homosexual tendencies.
No. 12 adequate school work.
No. 20 therapeutic insight.
No. 23 fair design for living.

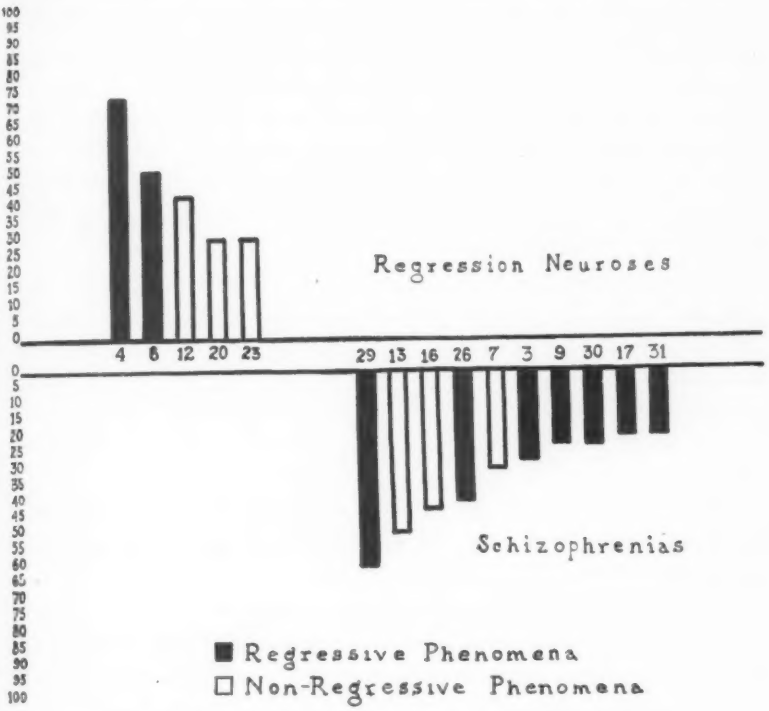
In the psychotic group 10 symptoms and signs predominated, 7 of which were regressive. In the order of frequency:

No. 29 delusions and hallucinations.
No. 13 no insight.
No. 16 inadequate school work.
No. 26 suicidal ideas.
No. 7 poor design for living.
No. 3 narrow interests.
No. 9 rigid personalities.
No. 30 asocial attitudes.
No. 17 antisocial attitudes.
No. 31 stupor.

At this point we deemed it advisable to determine the frequency of these signs among our schizophrenics. Only 1 patient (who

CHART III.

SYMPTOMS AND SIGNS PREDOMINATING BY MORE THAN 20 PER CENT.



4. Benign reactive depression.
6. Narcisstic-homosexual tendencies.
12. Adequate school work.
20. Therapeutic insight.
23. Fair design for living.
29. Delusions and hallucinations.
13. No insight.
16. Inadequate school work.
26. Suicidal threats.
7. Poor design for living.
3. Narrow interests.
9. Rigid personality.
30. Asocial attitudes.
17. Antisocial attitudes.
31. Stupor.

has since recovered) had as few as 3; the other 9 had 5 or more, with an average of 6.6 for the entire group. In contrast, the neurotic group had an average of 3.2 such symptoms and signs, 4 having had none and 3 having had 6 each (the highest number).

In attempting an early diagnosis of schizophrenia it is evident that delusions, hallucinations and stupor will be of little aid. Subtracting, therefore, these from the 10 predominants in the psychotic group one finds that the following picture evolves, a rigid personality (No. 9), extremely deficient in good social attitudes (Nos. 17, 30), having narrow interests (No. 3), a poor design for living (No. 7), and inclined toward suicidal ideas (No. 26), unsatisfactory school work (No. 16), and whose insight toward the entire picture is totally lacking (No. 13).

Since in our group the presence of several of these symptoms and signs in the same individual was twice as frequent in the psychotic as in the neurotic, their early detection may prove of significance. Naturally where 5 or more are present in 1 individual this significance is increased.

It is our intention, in the next 3 years, to utilize these 8 symptoms and signs as a rough yard stick in the evaluation of regressive patients. Whether or not they will prove of some diagnostic aid remains to be seen.

Summary.

1. An attempt has been made to contrast the symptoms and signs observed in 10 cases of schizophrenia and in 30 cases of regression neuroses.

2. All cases occurred in university students.

3. The impressions resulting from a statistical study would indicate that the following symptoms and signs occurred twice as frequently in the schizophrenics as in the regression neuroses: (a) rigid personality, (b) extreme deficiency in good social attitudes, (c) narrow interests, (d) poor design for living, (e) tendency for suicidal ideas, (f) unsatisfactory school work, and (g) lack of insight.

4. While no conclusions are attempted it is suggested that combinations of 3 or more of the above symptoms and signs might be regarded as suggesting a schizophrenic reaction.

5. With these symptoms and signs in mind a further study is being undertaken in order to test their possible value in differential diagnosis between schizophrenia and regression neuroses.

BIBLIOGRAPHY.

1. Miller, W. R.: Early schizophrenia and its relationship to the neuroses. Paper read at the ninety-fifth annual meeting of the American Psychiatric Association, Chicago, 1939.
2. Cameron, D. E.: American Psychiatric Association, 1939.
3. Washburne, A. C.: Feelings of unreality and displacement. J. of Nerv. and Ment. Dis., 89: 37-43, January, 1939.
4. Titley, W. B.: Prepsychotic personality of patients with agitated depression. Arch. Neurol. and Psychiat., 39: 333-342, February, 1938.

THERAPY IN INVOLUTIONAL MELANCHOLIA.*

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AND

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This communication is the second report of a study of the involutional melancholia problem begun in 1935 by two of the present authors.[1] The original paper entitled, "The Involutional Melancholia Process" was presented at the 1938 meeting of the American Psychiatric Association and was published in October of that year. Some of the results of that study called for further investigation and some of the findings regarding the prepsychotic personal history, the prodromal stages of the psychotic breakdown, and the precipitating situation, naturally led to some constructive suggestions regarding therapy aimed at prevention. Furthermore, because of the uniformly bad prognosis in involutional melancholia, review of treatments and investigation of newer therapeutic methods were indicated. This communication will attempt to evaluate the therapeutic techniques in use at this time and to formulate some approach to the mental hygiene of the involutional period.

It is essential that we make a distinction between "menopausal symptoms" frequently observed during the climacteric and the grave mental illness of involutional melancholia. Symptoms common to the menopause include a wide range of physiological and functional manifestations together with certain psychological reactions which are almost necessary accompaniments of conscious

* Read at the ninety-sixth annual meeting of The American Psychiatric Association, Cincinnati, Ohio, May 20-24, 1940.

From the Department of Psychiatry, School of Medicine, University of Pennsylvania, and the Institute and Department for Mental and Nervous Diseases of the Pennsylvania Hospital, Philadelphia, and Blythewood Sanatorium, Greenwich, Conn. Aided in part by a grant from the John and Mary Markle Foundation.

realization of the onset of the process of involution. It is stated by various authorities that only about 15 per cent of all women have "some difficulty" during the menopause and that the symptoms are of either nervous or vasomotor types in addition to the usual irregularity and cessation of periods. It is generally acknowledged by psychiatrists that a very small fraction of women who have menopausal disturbances of one kind or another actually develop the mental illness of involutional melancholia. Study of the literature relative to endocrine therapy during the involutional period leads us to believe that serious errors are made in reporting optimistically on certain supposedly specific therapies for involutional melancholia. In reality, the entity described in some of these papers as involutional melancholia is simply a combination of minor nervous instabilities, dyspnoea, hot flashes, nervous tension, vertigo, headaches, sweats, paresthesias and the vague neurasthenic manifestations which often accompany the change of life. That these manifestations are of benign character and rarely lead into involutional melancholia is demonstrated by the fact that such a small percentage of women (treated or untreated by endocrine therapy) develop the involutional melancholia psychosis. We propose to limit the term *involutional melancholia* to the actual mental disease as it is known in psychiatric nomenclature, and as defined and elucidated in various authoritative psychiatric texts. Our studies have shown that patients developing involutional melancholia suffer a breakdown in this era because of the culmination of many forces. The endocrine imbalance is not the primary factor and perhaps not always a significant one in the development of the mental disorder.

Etiological and Precipitating Factors.

Menopause.—In our study of involutional women, 53 cases have been reviewed carefully and it has been found that in only 13 (24 per cent) is menopause sufficiently close in time relationship to be considered a factor in the development of involutional melancholia. Chart I presents the time relationship between menopause and the development of the psychosis.

Personality Disorders.—If the fact of menopause, together with its disruption of endocrine balance, is only one of the contributory

factors, it is essential that we present evidence of other factors which comprise at least a portion of the total threat to the mental equilibrium of the involutional person. These forces, which we believe to be of far greater significance in the etiology of the disorder than the physiological maladjustments, have to do with the unique features of the prepsychotic personality. A careful inspection of the early life history of the patient with involutional melancholia shows that from childhood or puberty he has been

CHART I.

Menstrual history.	No. of women.	
Menorrhagia and metrorrhagia	3	13 or 24 per cent
Irregular periods	3	
Menopause		
6 mos. to 1 year before P. I.	7	
1½ years before P. I.	2	
2 years before P. I.	2	
3 years before P. I.	5	
4 years before P. I.	3	
5 years before P. I.	6	
7 years before P. I.	1	
8 years before P. I.	2	
11 years before P. I.	2	
12 years before P. I.	4	
13 years before P. I.	2	
15 years before P. I.	1	
Periods normal and regular	10	
Total	53	

an unusually guarded introvert, not even allowing himself the fantasied outlets of the freer, more harmoniously adjusted introvert. The person with potential involutional melancholia has generally imposed a heavy burden on himself in the form of numerous restrictions on his instinctual life, has avoided pleasure to the point of fanaticism and has set up for himself a stern, unbending moral code, which no ordinary mortal could hope to satisfy. Pathologically inhibited, scrupulously meticulous about trifles, chronically worrisome, either justifiably or not, unable to free his affective forces for the uses of normally warm human relationships, he has guided his life firmly into a narrow, affectless road, which could at best only stifle the free play of personality. Rigidity

is generally found to be of such pronounced degree that it not only shows itself in the psychic attitudes of the patient but is even transferred to the soma in the form of pathologic tensions and hypochondriacal disturbances of sensation. The psychotic phase is the culmination of a life-long psychobiologic process of a distinct character; the pathologic markings are unique at each stage of the process. The outstanding characteristic (rigidity) of the personality drives the person into pathologic reaction formations at various stages of his career and prepares the way for the development of psychosis at the crucial era of transition into the late middle years.

Not only do the limitations of the personality foster the development of involutional melancholia at the time of the climacteric, but, in a real sense, the degree of limitation of the personality determines the prognosis after the onset of the psychotic stage. The relation of personality type to prognosis is a definite one. All of those in our study of 50 cases who failed to recover showed marked restriction of the mental horizon throughout life and the majority (60 per cent) showed classic "obsessional character." Only 26 per cent of those who recovered showed obsessive traits. Since involutional melancholia represents one phase in the development of a life-long biologic process, one is justified in drawing prognostic conclusions from an evalution of the fixity of this biologic process in the prepsychotic stages. A general inadequacy in the sphere of sex life was noted in both men and women. Nearly all of the men who were married showed definite inadequate sexual adjustment. All of the women who were married and moderately well adjusted sexually recovered. All of the women who were married and poorly adjusted sexually failed to recover. 33⅓ per cent of the men who were married and moderately well adjusted recovered, while 16 per cent of the men who were married and poorly adjusted recovered. All of the unmarried men and 80 per cent of the unmarried women failed to recover.

The attitude of the women toward the menses and toward the menopause was of particular significance because it seemed to us that the individual outlook on these states was of greater significance in the etiology of the involutional melancholia than were the physiological complications. Only 35 per cent of the women had a history of irregular periods or menopausal anxiety, while 65 per

cent were singularly free from any such complications. The factor leading to downfall seemed more relevant to the general psychological state in the transitional era, or to definite trauma bearing a special import because of advancing age. In attempting to account for their mental disorder, only four patients attributed the onset to the menopause.

The Precipitating Situation.—The weight and the quality of the precipitating situations were studied in all cases in an attempt to throw some light on the various combinations of forces which tended to bring about suddenly the appearance of the psychotic symptoms. Chart II of precipitating factors contains the data from Mabon,[2] Brew,[3] Henderson and Gillespie [4] and the authors.

In our analysis of precipitating situations it was found that 68

CHART II.

PRECIPITATING FACTORS IN THE ONSET OF INVOLUTIONAL MELANCHOLIA.

Source of data.	Somatic, per cent.	Somatopsychic, per cent.	Psychic, per cent.
Mabon	34	17	47
Brew	38	20	42
Henderson and Gillespie (men)	6	24	70
Henderson and Gillespie (women)	21	22	57
Authors	6	26	68

per cent were psychic, 6 per cent were physical and 26 per cent were a combination of both. The predominant symbolic character of the psychic situations is important in the precipitating episodes in nearly all cases. They all in some manner constituted a threat to the ego. Throughout the life history, the involutional patient reveals a striking resistance to psychic trauma, to physical and environmental hardships, and has met them with strong protective measures. It is only when the individual encounters at last the numerous traumata of the transitional involutional years that he breaks down into psychosis. Of these the climacteric plays only a minor part and seems unimportant in the total picture. These difficulties with which the patient is faced represent in symbolic form the culmination of life difficulties, failing health, diminished vitality, the enforced relinquishing of more vigorous activities, loss of financial productiveness, a restriction of the sphere of personal influence and power, loss of spouse or close friends. Dismissal

from occupation, fear of chronic organic disease, fear of sexual impotence; such are the psychic traumata which the involutional patient faces and under which he crumbles, but not without a display of tremendous resistance.

The Psychotic Manifestations.—Detailed description of the clinical picture of the full-blown involutional melancholia psychosis is unnecessary, since the various manifestations are adequately described in a number of authoritative texts. Nor is it essential to the purpose of this paper to undertake a delineation of the psychopathology of the various psychotic symptoms. It is sufficient to emphasize again the enormous distress, anxiety and fear which torture the patient and which call forth from the psychiatrist every possible therapeutic effort. The distressing clinical picture, together with the threat of chronicity, make the newer drastic therapies seem justifiable.

Therapeutic Methods.

Narcosis Therapy.—Prolonged narcosis as therapy in involutional melancholia has not been adequately tested. Our experience shows that the chief value of this procedure is in the manic-depressive, manic reactions in which a fairly high percentage of recoveries can be anticipated. Narcosis therapy may be looked upon in some cases of intense agitation in involutional melancholia as a necessary and enforced rest treatment. If for no other reason it may be welcome as a method of inducing a period of calm serenity which offers at least temporary relief from torment. Not to be overlooked are the psychological effects of release resulting from the narcotic agents. Contact is promoted, psychotic resistance is broken through and the patient may become accessible to other therapeutic endeavors, or he may be helped to reveal hidden sources of conflict and worry which in the waking state are not available to the patient or to the physician. There also appears to be some degree of physiological readjustment paralleling and possibly constructively influencing the psychological changes. The physical hazards of narcosis therapy during the involutional period do not seem to be too alarming especially when compared with the other more drastic modes of treatment. We have treated involutional melancholia patients ranging from 44 to 67 years of

age and have encountered no dangerous complications. A fuller discussion of the subject of narcosis therapy is available elsewhere,[5] but it is the belief of the authors that widespread use of this method of treatment might demonstrate its considerable constructive value in the treatment of involutional melancholia. The results in 12 cases are included in the treatment summary chart.

Convulsive Shock Therapy.—Metrazol convulsive shock treatment appears to give great promise. At the Pennsylvania Hospital 27 involutional melancholia patients have been treated with convulsant agents (Metrazol—22, and Azoman—5) under the direction of Dr. T. D. Rivers.[6] The results in our 7 male and 20 female

CHART III.

METRAZOL THERAPY.

Source of data.	Total number treated.	Recovered (full remission).	Greatly improved (social remission).	Improved	Unimproved.
Pennsylvania Hospital ..	27	10	5	4	8
A. E. Bennett.....	24	11	12 *	..	1
D. C. Wilson.....	19	9	4	3	3
Total	70	30	21	7	12
Percentage		42.8	30	10	17.2

* 2 relapses recovered in second course.

patients are shown in Chart III which for comparison contains also the treatment data of A. E. Bennett [7] and D. C. Wilson.[8]

The results of metrazol therapy in these widely separated centers are strikingly similar and all highly encouraging. There is likewise, little difference in the criteria by which response to treatment is judged. At the Pennsylvania Hospital *"recovered"* means full remission and prompt return to former normal status and continuing normal adjustment at the present time. *"Greatly improved"* means social remission, recovery not complete, but nearly so. *"Improved"* means that by reason of metrazol therapy the patient is less agitated, less depressed and, in general, has a better hospital adjustment. *"Unimproved"* means that no mental change, for better or worse, resulted from the treatment.

The traumatic complications of metrazol therapy constitute its major risk although some injury to the cardiac muscle has also

been reported.[9] If metrazol, which appears to be the most specific therapy thus far discovered for involutional melancholia and for the depressive states is to survive as a standard method, these complications must be controlled. Steps in that direction have been taken already by Bennett [10] who has used spinal anesthesia, 10 mg. of pontocaine or 100 mg. of novocaine given one hour before metrazol shock. More recently the same investigator [11] has used curare in attempts to minimize the traumatic complications. The complications occurring in our 27 involutional cases are listed

CHART IV.
COMPLICATIONS.

Case No.	Complication.	Treatment in which complication occurred.	No. of convulsions.	Sex.	Age.	Results (mental condition).
18	Avulsion of tuberosity of L. humoral head...	4	3	F	45	Greatly improved.
12	Ulnar nerve palsy.....	13	7	F	51	Unimproved.
9	Fracture fifth and sixth thoracic vertebrae....	1	1	M	51	Improved.
22	Fracture seventh thoracic vertebrae.....	3	3	F	45	Improved but relapsed.
28	Fracture of both femora and twelfth thoracic vertebrae.....	3	3	F	49	Unimproved.
21	Cardiac damage.....	2	2	F	52	Improved.

in Chart IV. The average age of those in whom complications occurred was 49 years and five out of the six occurred in women patients.

The traumatic complications in our experience tend to occur more frequently in the older patients, whereas in Bennett's reports it is stated that the four fractures occurring in 1000 treatments all were in younger persons. Wilson reports that six of his nineteen patients had "back pain" after metrazol therapy and that these showed "cupping of the bodies of the vertebræ."

Psychiatry must admit the alarming nature of the complications attendant upon metrazol therapy and, in spite of all newer methods for minimizing the traumatic consequences, some injury is likely to result, either from the force of the shock treatment itself or

from the agents with which we are attempting to soften the mechanical stresses of the actual convulsion. The threat of complications, however, should not interfere with further study of the therapeutic benefits of convulsive shock therapy. The fact that in a reasonably large number of cases only 17 per cent fail to respond with some degree of improvement or recovery is reason enough to continue use of the method, with, of course, every improvement which can reduce the accident rate without too greatly reducing the therapeutic efficacy. In our group the average number of convulsions was small, being 7 in the "recovered," 5 in the "greatly improved," 3 in the "improved" and 4 in the "unimproved." The rate of recovery under metrazol therapy appears in

CHART V.

DURATION OF PSYCHOSIS IN RELATION TO RECOVERY RATE.

Duration of illness before treatment.	No. of cases.	Recovered.	Greatly improved.	Improved	Unimproved.
6 months or less.....	9	4	2	2	1
1 year	6	3	1	1	1
1½ years	5	3	..	1	1
2 years	2	..	2	..	..
3 years	2	..	..	..	2
4 years	2	..	..	..	2
7 years	1	..	..	..	1

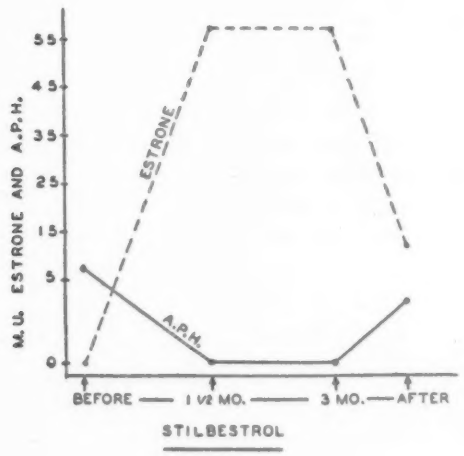
Chart V to be directly related to the promptness of treatment after the onset of the psychosis.

Convulsive therapy induced by means of electric shock has been under consideration at the Pennsylvania Hospital and elsewhere, and preliminary studies of its effect on laboratory animals have been made. Clinical tests so far indicate its therapeutic usefulness and, possibly, a greater safety factor. Several advantages over chemically induced convulsive therapy may lead to its wide use. The patient is at once rendered unconscious at the first moment of shock and there is loss of memory for the treatment period, so that the factor of fear and distress is at once overcome. The mechanical stresses are thought to be less severe. If, on wider clinical use, these or other advantages become established, the method will have special value in the treatment of involutional melancholia.

Endocrine Therapy.—Estrogenic hormone administration in the treatment of female involutional melancholias appears on the surface to be a logical therapeutic method especially if the menopause and its attendant glandular disturbances are thought to be etiologically significant. The subject is highly controversial but needlessly so if careful study of the involutional melancholia process is made as well as a differentiation between menopausal symptoms of benign character and the psychosis of involutional melancholia. Werner and his co-workers [12] report that 66 to 92 per cent of patients suffering from involutional melancholia recover when given adequate estrogenic therapy. Others [13] fail to find any benefit whatever from these substances in the treatment of involutional melancholia. At the Pennsylvania Hospital hormone therapy in the female involutional melancholia patients has been given with considerable consistency since 1922 when Strecker and Keyes [14] administered intramuscular preparations of ovarian extracts to 14 patients, 6 of whom recovered. Up to the present time, however, we have made no other carefully controlled study free from other specific therapeutic efforts. In order to test the value of estrogenic hormones alone in the treatment of involutional melancholia, we undertook intensive three month's study of 11 patients committed to the Pennsylvania Hospital, Department for Mental and Nervous Diseases. The estrogenic substance employed was the new synthetic Stilbestrol.* Numerous reports indicate that its physiological action is as potent when administered orally as when administered parenterally. It seemed to us of considerable importance to carry out this study without the aid of any other form of therapy and without the inclusion of any force, either psychiatric or somatic, in the picture. If estrogenic hormones can be made to produce recovery rates of upward of 80 per cent in a psychosis whose most favorable prognosis we have found to be at best 38 per cent, without the use of Metrazol or other hazardous therapy, then there is little justification for not urging its widespread application. On the other hand, if it can be established that in the psychotic phase of involutional melancholia estrogenic hormones are of no value in bringing about a recovery or significant

* The Stilbestrol used in this study was furnished by the Eli Lilly Company, Indianapolis, Ind.

relief of symptoms, then it would seem pointless to delay the administration of more promising and specific methods, such as metrazol or electric shock, by experimentation with estrogenic hormones. The 11 patients included in this study were within the involutional age limits, all had been diagnosed by staff conference as having involutional melancholia, none had had previous psychotic episodes, and the prepsychotic personality and clinical symptomatology were classical for this type of disorder. Eight of the eleven patients were given 5 mg. of Stilbestrol orally every other day and



GRAPH 1.

three received 5 mg. daily for a test period of three months. Four cases were chosen for detailed laboratory studies which included quantitative urinary estrone and APH determinations before, during and after treatment, and microscopic study of the vaginal smears for determination of epithelial estrus effect. The results are shown in Graph 1 which expresses values in terms of mouse units.

Clinically, five of the eleven patients had periods of uterine bleeding for the first time in 12, 12, 4, 4 and 1½ yrs. respectively. No instances of severe hemorrhage were seen. In one woman of 50 with involutional psychosis, 5 mg. of the drug given intramuscularly produced uterine bleeding within 14 hours. This patient had ceased

menstruating five years before at the age of 45. No breast engorgement occurred although pelvic congestion, burning urination and genital sensations indicated estrin saturation. Uterine bleeding occurred at two phases in five patients, first at some time during the administration of the drug, apparently without consistent relation to the dose, and again within a day or two after abrupt withdrawal of the drug.

Toxic symptoms were observed in two patients. One had mild, transient nausea and vomiting during the first two weeks of treatment. The other patient developed "fogginess in the head," ataxia

CHART VI.

RESULTS OF STILBESTROL THERAPY.

Case.	Age.	Age at menopause.	Duration of psychosis.	Previous Estrogenic therapy.	Total dosage of stilbestrol in mg.	Psychiatric results.	Toxic Symptoms of stilbestrol.	Induction of uterine bleeding.
1	58	44	6 years	Yes	310	Unimproved	..	..
2	50	46	4 years	..	191	Unimproved	..	Yes
3	52	48	3 years	Yes	206	Unimproved	Yes	Yes
4	40	40	5 months	Yes	270	Worse	Yes	..
5	52	40	3 months	..	205	Worse	..	Yes
6	50	47	3 years	Yes	262	Unimproved	..	Yes
7	59	49	6 months	Yes	475	Worse	..	..
8	58	46	10 years	Yes	340	Unimproved	..	Yes
9	65	47	6 years	Yes	436	Unimproved	..	..
10	51	51	1 year	..	45	Unimproved	..	..
11	49	48	1½ years	Yes	240	Unimproved	..	Yes

with staggering gait, and many somatic complaints. Neurological examination was negative. These symptoms persisted for two months after the drug had been stopped. She was then given metrazol therapy and recovered promptly. She has now been out of the hospital four months and shows no sign of neurological abnormality. Her husband states, "She is better than she has been for 10 years." From the psychiatric standpoint, eight of the cases showed no change during the three months of drug administration. Three became more agitated and depressed coincidental with receiving the medication. In the 11 cases, then, no instance of improvement in the psychosis was seen. Four of the eleven cases subsequently received metrazol therapy and three achieved complete remission. The fourth is now receiving curare modified metrazol treatment and has been much improved.

Our experience with the estrogenic therapy in the psychotic phase of involutional melancholia is discouraging. We believe that this form of therapy is useful and productive of great relief in certain of the menopausal symptoms and perhaps in some way may be directly beneficial in the disturbed mental states of the prepsychotic phase of involutional melancholia. In 6 cases of impending involutional melancholia marked benefits were observed under a plan of treatment which combined intensive mental hygiene efforts and the administration of estrogenic hormones. Our opinion regarding estrogenic therapy can be summarized as follows: Estrogenic therapy should be given for the relief of specific menopausal symptoms and it should be administered to any patient suffering from involutional melancholia when such indications are present. In other words, because of its failure to produce recovery from the mental disease it should not be denied any involutional melancholia patient who is suffering from hot flashes, sweats, tension and uneasiness, headaches, etc. It may be justifiable to recommend that all involutional melancholia cases upon whom close supervision is possible, should receive a three months therapeutic test with adequate dosage of estrogenic substances. The object of estrogenic therapy is not necessarily that of reestablishment of the menstrual cycle, but is to obtain relief from symptoms. The duration of menopausal symptoms is probably shortened by adequate estrogenic therapy, partly because the estrogens tend to inhibit ovarian function. Some authorities believe that the menopause may be shortened to one third its usual length by judicious use of endocrine therapy, and at the same time complete relief from troublesome symptoms can be attained. Oral therapy is preferable wherever possible and doses of 2000 international units per day are usually sufficient to control symptoms except in times of nervous stress. Intramuscular injection of 2000 to 5000 units in oil given daily or twice weekly may be necessary and are considered conservative amounts. Higher dosages, up to 30,000 units per week, is not excessive in carrying out a therapeutic test in early involutional melancholia. We have found that the best methods of estimation of adequate dosage are: (a) the clinical signs of relief from flushes and sweats, (b) the evidence on slides prepared from vaginal smears of the full estrus effect, (c) the measurement of mouse units of APH and estrogenic hormones in the urine before

and at monthly intervals during the treatment. The gross signs of overdosage are vaginal bleedings, feelings of intense congestion in the pelvis, engorgement of the breasts and sexual stimulation.

Testosterone therapy in the male involutional period has been strongly recommended and here, too, the results have been reported as highly promising. During the past four years we have given androgenic therapy to a number of men suffering from a variety of symptoms indicating probable testicular insufficiency. Testosterone cannot be considered a substitute for all of the testicular hormones since it is a product of interstitial tissue only. Because of the greater gonadotropic secretory function of the male pituitary, considerably larger doses must be used to accomplish inhibition of this function. It is said to have greater value in the replacement of castration syndromes than in accomplishing inhibition of the anterior pituitary. The customary dose is 5 to 10 mg. of testosterone propionate in oil administered intramuscularly 2 to 4 times weekly.* Estrogenic substances are said to have some value for the control of autonomic symptoms in males during the involutional period. In 1938 we separated out for clinical test 10 involutional melancholia patients. The symptoms included headache, weakness, extreme fatigability, prostatic difficulties, impotence, loss of sex interest, "tight feelings in the head," in addition to the restless agitation, depression, insomnia and characteristic psychotic manifestations. The results shown in Chart VII indicate that as in all therapeutic efforts in psychiatry the best results can be anticipated in the patients treated promptly after the onset of symptoms.

Parathormone Therapy.†—In 1937 Lehman [15] investigated the rôle of calcium on the activity of nerves. The results of his experiments showed that when a nerve was deficient in calcium (ionized) it began to fire spontaneously. This spontaneous activity or tetany could be abolished by restoring the normal calcium balance. Lehman's findings gave rise to the thought that similar changes might be taking place in the nervous system of agitated psychotic patients and that the motor activity of these patients might be related to

*The testosterone propionate (Oreton) used in this study was furnished by the Schering Corporation, Bloomfield, N. J.

†The study of Parathyroid hormone therapy in involutional melancholia was made under a grant from the John and Mary Markle Foundation by Dr. Joseph Hughes and Dr. Francis J. Braceland.

CHART VII.

Testosterone Therapy in Involutional Males.

Case.	Age.	Date begun.	Duration of illness.	Duration of treatment.	No. of intramuscular injections.	Total mg. of testosterone.	Results.
1	60	5-17-38	10 mos.	5½ mos.	23	240	Sex dreams, erections. Better for 2 wks. Later more agitated and depressed.
2	57	6- 2-38	3 yrs.	3 mos.	20	125	Weaker, more agitated.
3	52	6-18-38	5 yrs.	3 mos.	14	375	Restless, nervous tension increasing.
4	63	4-10-38	7 mos.	7 mos.	51	1400	General feeling of well being. Physical efficiency improved, gain in weight.
5	61	5-15-38	10 yrs.	3 mos.	15	125	Prostatic symptoms partly relieved. No help with agitation.
6	54	6-11-38	6 yrs.	5 mos.	35	500	No mental or physical improvement.
7	51	6- 6-38	3 yrs.	4 mos.	22	370	No mental or physical improvement.
8	55	11- 1-38	10 mos.	5 mos.	25	750	Physical fatigue and exhaustion relieved. Slight sexual stimulation and gain in weight.
9	60	11- 1-38	1½ yrs.	6 mos.	48	480	Prostatic symptoms relieved. General physical improvement, mental outlook brighter.
10	57	8-24-38	8 mos.	5 mos.	42	360	General health improved. Prostatic symptoms relieved, neurasthenic syndrome, and depression helped markedly.

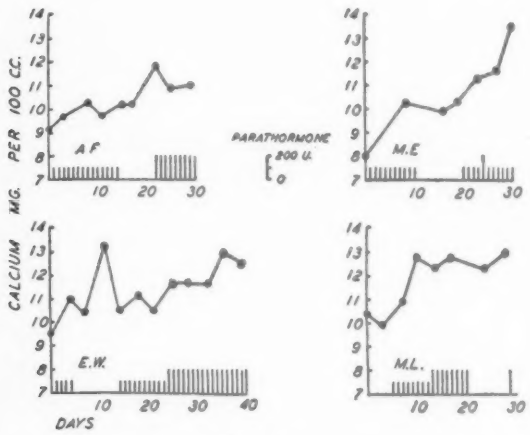
Results.	Cases.
Sexual stimulation	2
General physical improvement	4
Gain in weight and general physical improvement	2
Prostatic symptoms wholly or partly relieved	3
Improved mental state	2
No improvement in any way	5

disturbances in calcium metabolism. Kurzrok[16] and others have stated that calcium administered together with endocrine therapy in the menopausal states seemed to augment the beneficial effects of the estrogens. We have used this combined method extensively in clinical practice but until recently did not undertake a controlled study. The clinical evidence did not seem to support nor contravert the experience of others. In order that the rôle of calcium alone might be tested more carefully and in a clinical situation best designed to demonstrate its value, we undertook a study of 15 patients with involutional melancholia. The first step involved raising the serum calcium in this group of patients and observing their clinical course. This was accomplished by twice daily injections of 50 to 100 units of parathormone and the daily oral administration of 5 grams of ammonium chloride and 68 to 100 grains of calcium gluconate. All patients were treated in this manner for more than one month. The clinical results were negative. There was no improvement in clinical condition, nor was there any lessening in their motor overactivity in spite of the increase in serum calcium. Four representative cases were chosen for repeated serum calcium determinations. The pre-treatment serum calcium levels varied as follows: 8, 9.2, 9.6, and 10.4 mg. per cent. Graph 2 shows the serum calcium values obtained. Since, with the obvious rise in serum calcium none of the four patients improved, and, since none of the other eleven showed change, it can be concluded that there is no direct relationship between psychotic motor overactivity and serum calcium.

Psychotherapy.—Psychotherapy in involutional melancholia has been of little value. With all of the enthusiasm manifested in the deeper psychotherapeutic methods in other psychotic conditions, even those deeply rooted in constitutional factors, it is significant that to date no one has suggested its use in involutional melancholia. The power of the repressed hostile and aggressive impulses and the explosive nature of the barely submerged psychopathology would warn off even the most daring of the advocates of analytical technique. No more fixed or malignant psychiatric situation is to be found in the realm of psychiatry and psychotherapeutic efforts must be undertaken with extreme caution. A good rapport and patient attention to the individual's many troubles will offer opportunity for release of enormous emotional pressure which other-

wise calls for intensive repressive effort, but this relatively superficial relationship is about the maximum degree of penetration permissible. Psychotherapy, more indirect than direct, in the earliest prodromal stages may bring greater profit. Here, also, deep psychotherapy is to be avoided.

General Management.—It would be out of place in this paper to do more than mention the general psychiatric care of the involutional melancholia patient. Hospitalization is, of course, impera-



GRAPH 2.

tive not only because of the need for protection of the patient from self-injury but, also, because of the enormous strain imposed upon those responsible for the patient's care. The tension, agitation, restlessness, insomnia, wringing of hands and constantly reiterated delusions of self-accusation, etc., are more than any untrained person could possibly cope with. One of the peculiar features of the prepsychotic personality of the involutional melancholia patient is the intense nature of the demands made upon family and friends. In the psychosis, this suffers considerable exaggeration, becoming insistent, intrusive, urgent, persistent, virtually tyrannical, and actually making sadistic impositions on the rights and interests of others in the demand that they help the patient or share his

suffering. Drastic therapy should be carried out only under the closest possible hospital supervision. Occasionally it is reported that convulsive therapy can safely be given in the home or in the physician's office, but such practice has self-evident dangers and is to be disapproved.

Safeguarding therapy is, of course, imperative and watchfulness must never be relaxed. Physiotherapeutic measures in the form of hydrotherapy, packs, continuous baths, and ultraviolet exposure will be helpful in allaying some of the tension and restlessness, and may reduce the need for sedative drugs. Massage is usually not tolerated and stimulation to greater agitation rather than the desired relaxing effects may result. Many involutional melancholia patients cannot "stand to be touched" and seem to have intense fear that massage may arouse erotic impulses and heighten anxiety.

In occupational therapy less attention should be paid to the product than to the measures which bring about the greatest degree of objective focus of interest for the patient. Even transitory relief from suffering and anguish is noteworthy progress. The therapist must bear in mind that for the involutional melancholia patient with his long background of perfectionist and obsessive-compulsive traits nothing is ever finished to the patient's satisfaction.

Sedative medication may become necessary to prevent physical depletion from constant restlessness and insomnia. The less toxic barbiturates should be used in preference to the heavier, more slowly excreted drugs. It should be borne in mind that often the need for sedative and hypnotic medication is prolonged and there is some danger in the use of drugs which tend to create cumulative toxic effects. If agitation and insomnia are severe and if convulsive therapy is contraindicated, narcosis therapy may offer a great deal of help. Under prolonged narcosis many patients seem to improve in physical health, gain weight and derive general benefit from the enforced rest.

General nursing care, adequate caloric and vitamin content in the diet, and general tonic and supportive measures are, of course, routine.

Mental Hygiene.

As has been pointed out earlier in this paper, there are unique personality traits visible throughout the life history of the individual who ultimately develops involutional melancholia. The outstanding features are summarized in the term "rigidity" which characterizes not only the whole psychic life which is filled with obsessive-compulsive traits, but is evident also in the soma as tensions and hypochondriacal bodily fixations. In fact, the total psychobiological reaction is revealed as a process running throughout the life history like a single thread ending in the involutional period. Even in the psychosis, the features and content of the disorder display only more clearly the classical psychopathology of the "controlled" life.

CHART VIII.

Summary.

Therapy	Per cent recovered or social remission.	No. recovered.	No. greatly improved.	No. improved.	No. unimproved.	Total treated.
Metrazol..... Metrazol..22 Triazol.... 5	52	10	4	5	8	27
Narcosis.....	42	5	..	2	5	12
Endocrine Therapy						
(1) Estrogenic hormone (female)	0	0	0	0	11	11
(2) Testosterone (male).....	20	0	2	3	5	10
(3) Parathormone, calcium and ammonium chloride.....	0	0	0	0	15	15

Total number treated..... 75
Total number recovered or having social remission..... 21 (28 per cent)
General "Recovery" Rate (300 cases over 25-year period).... 30 per cent

If mental hygiene efforts are to be successful, the physician must be alert to the inherent dangers in the too strongly introverted, inhibited, highly repressed, narrow personality. Every effort should be made to "free up" the emotions, to promote relaxation, vacations, hobbies, and extraverted interests. Throughout all of the

histories constantly run the same phrases "he was a man devoted to his work, never took a vacation," or, "she was a devoted mother, worrisome about her family, conscientious to a fault," or, "she was a self-effacing, self-sacrificing, altogether consecrated person." These laudible traits are not to be deprecated and in our present world are very much to be praised, but even devotion and self-sacrifice can have their dangers when carried to extremes. The almost fanatical exclusion of all recreational interests and the marked restriction of pleasure seeking interests spread into every sphere of the patient's existence. The physician who is mental

CHART IX.

PRODROMAL PERIOD (50 CASES).

Duration.	Percentage.	Cases.
3 to 6 months.....	7	14
6 months to 1 year.....	16	32
1 year and over.....	12	24
2 years and over.....	8	16
3 years	3	6
4 years	2	4
5 years	1	2
7 years	1	2

Prodromal period of 6 months to 2 years in 72 per cent of cases.

hygiene conscious will have little difficulty in recognizing the unwholesome nature of such traits.

Not only in regard to life-long personality traits does the disorder possess a high degree of predictability, but, also, in the long germinating prodromal period there are numerous signs of failing control which should warn the physician of approaching danger. In our study, 86 per cent of cases had a prodromal period of six months or longer and 54 per cent one year or longer (see Chart IX). It is the extraordinary length of this prodromal struggle and the unusual resistance of the patient which are the concern of mental hygiene. Time favors the corrective attack.

Examination of the precipitating situations reveals the peculiar way in which the long-germinating prodromal processes suddenly undergo "flocculation." It was found that in nearly all patients even after irruption of the precipitating situation into the personal

life, there was slow, gradual development of the psychosis in what may be called distinct stages. The comparatively long prodromal period has a tendency to culminate suddenly in a clinical picture of severe anxiety and agitation, the ignition of which may be a fairly slight factor in the environment, or in the psyche which symbolizes for the patient his inability to cope any longer with what he believes to be hostile forces, whether external or internal. The subjective factors appear to be as important as the objective in bringing the psychosis to full development. It is, therefore, obvious that even in the imminent stages there is opportunity for energetic preventive efforts. It is in the earliest stages of impending breakdown that endocrine therapy may be utilized with some success wherever there are appropriate indications.

It seems scarcely necessary to stress the importance of the earliest recognition of impending breakdown. The development of persistent hypochondriacal trends is an early warning sign. There is preoccupation with physical discomforts, strange sensation, "unnatural feelings," pressure in the head, tight sensations about the head, interference with the functions of special sense organs, withdrawal of sex interest, genital sensations or feelings of sexual "deadness." The patient gradually becomes more withdrawing, constricting his social life even more rigorously than heretofore.

Restlessness becomes a part of the picture and irritability, impulsive anger and suspicious trends are not uncommon. Interest is withdrawn from external objects and egoism is heightened. Satisfaction in life disappears and contemplation of decline and death is substituted. Certain physical changes are in evidence; increased pulse rate, rise of blood pressure ("menopausal hypertension"), indigestion, anorexia, constipation and weight loss. The picture becomes increasingly severe and as it gains momentum the outstanding features are irritability, heightened intolerance, compulsions, insomnia, anxious depression, restless pacing. Finally there are added the characteristic feelings of insecurity, complete inadequacy, fear of the future and of impending dissolution. For the general practitioner who sees these problems in their incipiency the mental hygiene of the involutional period can be outlined as follows:

(1) Physicians, who undertake treatment of patients who are at this critical life epoch, not only should attend to the organic

factors, but also should give advice and counsel concerning social-environmental handicaps and should penetrate the minds of the patients at least deeply enough to discover and uproot any erroneous conception concerning the likelihood of the development of mental disease. Every woman should be psychologically prepared for the menopause, and the traditional ideas concerning its threat to the mind should be vigorously combatted. The physician should make a careful evalution of inherited organic, psychic and environmental flaws in each patient. From such evaluations will come sensible preventive and corrective measures and safeguards.

(2) Help with family problems is often required. The long interest and focus of energies upon child bearing and rearing of the children has now come to a close, and new interests and activities must be substituted. Not in every case can the solicitude and care for maturing children be easily relinquished. The parental attitude of the individual tending to develop involutional melancholia usually has been too protective with a strong inclination to excessive domination. Too frequently there have been inculcated in the children the same rigorous self-discipline and self-denial, the same inordinately high ethical and moral standards, which now overtake and endanger the declining years of the patient. Anxious care may intrude into the lives of the young persons and rebellion or rejection of the parents is sometimes the unhappy result. Apparent rejection of the parent by the children is thus added to the already heavy burden of disappointment, frustration, and regret, characteristic of this life era. Some insight should be given into the normal psychology of adolescent or maturing children. Very frequently unnecessary stresses are brought into parents' lives because of their misunderstanding of the normal psychological processes of maturing. The physician must help parents to understand the normal rebellion against parental authority and to see that too selfish tactics in attempting to circumscribe the younger person, or crushing this rebellion, can result badly, not only for the child but also can produce untold needless mental anguish for the parent.

(3) Sex misinformation should be dealt with if the patient furnishes an opportunity. A frank discussion of the sex problems arising at this time can be extremely helpful, but must be managed with the utmost diplomacy. Direct or bungling inquiry into sex relationships and sexual adjustments of the highly sensitive,

strongly repressed patient will do great harm. The patient should be allowed to raise the subject for frank discussion. It is a most common conviction among both men and women that at the menopause or change of life, sexual interest, and with it all possibility of sexual gratification, disappears. Abundant evidence shows that this is not the case. Sex interest may decline gradually during the fifties but the cessation of the menstrual cycle does not mean sudden withdrawal of sex interest from life nor abrupt senile atrophy of the genital organs. It is often true that opportunities for real companionship between husband and wife become possible at this age. The children have grown up, are in college or in homes of their own, and life can be made very full by a minimum of planning.

(4) The general management of patients during this period also calls for long rest periods, for regulated exercise, dietary control to combat constipation and sometimes small doses of sedative drugs. Careful gynecological or genito-urinary examinations should be made to rule out actual organic pathology. Occupational therapy, either in the form of hobbies undertaken independently or as formal instruction in the arts and crafts, cannot be overemphasized as a stabilizing factor in the early period of involution.

(5) Psychotherapy must be undertaken with extreme caution. The psychotherapeutic attack must be varied, taking into account the psychological make-up and background of the individual and the serious physiological maladjustments which accompany the menopause. A good rapport and patient attention to the individual's many troubles will give considerable relief and may allow the patient to dissipate enormous emotional pressure which otherwise would call for intensive efforts at suppression. It is our feeling that even in the earliest stages of the climacteric any psychoanalytic therapy or deep psychopathologic interpretations of the patient's sadistic or masochistic impulses must be strictly avoided. There is no more dangerous psychiatric situation than that encountered in impending involutional melancholia. It is wise to keep the therapeutic management on a common sense level.

(6) Compensations and substitutions for the former solicitude directed toward the children and family interests must now be sought. It will tax the ingenuity of the practitioner to overcome the rapidly constricting sphere of interest and to generate en-

thusiasm for women's clubs, political interests, various hobbies, organized recreations and other wholesome outlets. The patients should be helped to see that now, when the need for close supervision of children is no longer necessary, they have unusual opportunities to carry out long cherished wishes for personal satisfaction. It may be essential when the process of isolation has begun and is in danger of becoming fixed, that a formal schedule of activities and planned campaign be drawn up to combat the increasing egocentricity and contraction of the patient's life.

(7) A few words can sum up the whole program for the mental hygiene of the involutional period. Expand, socialize, combat introversion and the constriction of the personality, combat misinformation, foster hobbies and interests, aerate and ventilate the patient's mind with recreation and consistently prevent the growing threat of egocentricity.

Summary.

(1) There must be in the minds of medical men a sharp differentiation between the psychosis involutional melancholia and the benign "menopausal symptoms" common to both females and males at the climacteric.

(2) The endocrine factors incident to change of life are not the important etiological or precipitating factors in the psychosis. In only 24 per cent of 53 women did there seem to be any relationship between the onset of menopause and the onset of the psychosis.

(3) Life long restrictions of the personality and traits deeply rooted in the psychobiology of the individual are more significant than physiological factors in the etiology of involutional melancholia. The psychosis appears to be the culmination of many forces operating throughout the life history of the patient.

(4) Metrazol therapy, which in nearly 73 per cent brings about favorable change classifiable as "recovery" or as "social remission," is the most successful treatment thus far developed. Unmodified metrazol therapy with its serious hazards probably cannot continue as a standard method. Because of the poor prognosis in involutional melancholia (30 per cent in 300 cases at the Pennsylvania Hospital) some form of convulsive shock therapy seems

justifiable, especially if the newer modifications of metrazol treatment or electric shock prove helpful in reducing the traumatic risk without interfering with the effectiveness of the treatment. Although brilliant recoveries are occasionally recorded in long standing cases of involutional melancholia, our results indicate that promptness is an important factor in the success of treatment.

(5) Prolonged narcosis has been helpful in a small number of cases and has given rise to no serious complications. It should be tested further in a larger number of cases.

(6) Estrogenic therapy in female involutional melancholia patients has no favorable effect on the course of the psychosis. Stilbestrol is a potent estrogenic substance and when administered orally is capable of producing estrin saturation as evidenced by the changes in urinary APH and estrin values, by the induced uterine bleeding, and by other clinical signs of estrin effect.

(7) Testosterone administered by intramuscular injection in male involutionals is capable of producing sexual stimulation, a general improvement in physical well being, and may reduce symptoms arising from benign prostatic hypertrophy. Its beneficial effect in the psychotic stages is questionable, but some improvement has been noted in two men with early involutional melancholia.

(8) Parathormone administered hypodermically in twice daily doses of 50 and 100 units, together with calcium and ammonium chloride, increases serum calcium levels. This therapy has no effect on the clinical course of the disorder.

(9) Mental hygiene efforts to dislodge the fixed, unwholesome, personality patterns at the moment of recognition may do much to prevent the development of involutional melancholia. Time favors the mental hygienist since even after the appearance of prodromal symptoms there is a period of long germination, shown in our studies to be six months or more in 86 per cent of cases.

(10) This psychosis numerically seventh in importance and shown to have a low recovery rate has been much neglected by psychiatrists until recent years. This paper is intended to stress not only active therapeutic measures in the psychosis, but, also, the great importance of early recognition of the prodromal symptoms. We have pointed out the outstanding features of the prepsychotic personality and have stressed opportunities for mental hygiene.

BIBLIOGRAPHY.

1. Palmer, Harold D., and Sherman, Steven H.: The involutional melancholia process. Arch. Neurol. & Psychiat., 40: 762, 1938.
2. Mabon (see 4).
3. Brew, M. F.: Precipitating factors in involutional melancholias. State Hosp. Quart., 10: 422, 1925.
4. Henderson, D. K., and Gillespie, R. D.: Textbook of psychiatry. Ed. 3, New York, Oxford University Press, 1933.
5. Palmer, Harold D., and Braceland, Francis J.: Six years' experience with narcosis therapy in psychiatry. Am. J. Psychiat., 94: 37, 1937.
6. Rivers, T. D.: Personal communication.
7. Bennett, A. E.: Metrazol convulsive shock therapy in affective psychoses. Am. J. Med. Sc., 198: 695-701, Nov. 1939.
8. Wilson, D. C.: The results of shock therapy in the treatment of affective disorders. Am. J. Psychiat., 96: 673, Nov. 1939.
9. Flaherty, J. A., Rome, H. P., and Zintl, F. W.: Observations on the electrocardiographic picture during metrazol therapy. Arch. Neurol. & Psychiat., 41: 860, 1939.
10. Hamsa, W. R., and Bennett, A. E.: Traumatic complications of convulsive shock therapy. A method of preventing fractures of the spine and lower extremities. J. A. M. A., 112: 2244-2246, June 3, 1939.
11. Bennett, A. E.: Preventing traumatic complications in convulsive shock therapy by curare. J. A. M. A., 114: 322-324, Jan. 27, 1940.
12. Werner, A. A., et al.: Involutional melancholia. Arch. Neurol. & Psychiat., 35: 1076, May, 1936.
    Werner, A. A., et al.: Theelin therapy in the psychoses. J. A. M. A., 109: 1786, Nov. 1937.
13. Schube, P. G., McManamy, M. D., Trapp, C. E., and Houser, G. F.: Involutional melancholia treatment with theelin. Arch. Neurol. & Psychiat., 38: 505, Sept. 1937.
    Bowman, K. M., and Bender, L.: Treatment of involutional melancholia with ovarian hormone. Am. Jour. Psychiat., 88: 867, March 1932.
14. Strecker, E. A., and Keyes, B. L.: Ovarian therapy in involutional melancholia. N. Y. Med. J., 116: 30, July 1922.
15. Lehmann, J. F.: The effect of changes in the potassium-calcium balance on the action of mammalian nerve fibers. Am. J. Physiol., 118 No. 3, March 1937.
16. Kurzrok, L., Birnberg, C. H., and Livingston, S.: The treatment of female menopause with male sex hormone. Endocrinology, 24: 347, March 1939.

DISCUSSION.

DR. EUGENE DAVIDOFF (Syracuse, New York).—One is impressed with Dr. Palmer's comprehensive and excellent review of the therapeutic measures

which have been employed in the involutional psychoses at the Institute of Pennsylvania Hospital. Equally laudable is the effort to delimit a specific reaction type with regard to the "involutional melancholia" group.

A difference of opinion exists as to the nature of the concept of involutional psychoses, the criteria for diagnosis and its individual features. It would appear somewhat difficult to differentiate some of Dr. Palmer's cases possessing "rigid" pre-psychotic personalities from true, late appearing or "masked" schizophrenias. The long prodromal period, later personality factors and the exact time of appearance of early involutional signs in different individuals add to the difficulties of appraising the pre-psychotic personality. How shall we evaluate the paranoid types?

Bleuler has allied them with the schizophrenias. McCurdy has allied some of these cases experiencing silly delusions with the schizophrenic group, and some with the psychotic group. White has placed them in the pre-senile group.

In 1925, my co-worker, Dr. Brew, called attention to the occurrence of schizoid personalities in this psychosis. In 1938, we reviewed 176 consecutive cases admitted to the Syracuse Psychopathic Hospital and found that 105, or about 60 per cent, possessed the rigid personalities described by Dr. Palmer but also found 53 pure extraverts and 58 mixed types. We found that 123 were poorly integrated but that 73 adjusted well prior to the involutional period. We felt, therefore, as does Dr. Palmer, that many of these cases were not schizophrenias because of compensatory factors in the pre-psychotic personality which enabled them to ward off a psychosis prior to the involutional period. In a psychosis due to the manifold influences in this phase of life, many of the previous personality traits color the picture as they do in organic or functional psychosis. However, involutional psychoses present a more peculiar complex mixture of organic and psychogenic factors.

In regard to prognosis on the basis of pre-psychotic personality, our statistics vary somewhat from Dr. Palmer's. We found that the pre-psychotic personality did not materially influence the prognosis, as much as Dr. Palmer's figures would seem to indicate. As a result, we have classified involutional psychosis somewhat differently, depending on quantitative or qualtitative differences with respect to the non-psychotic involutional syndrome. The results of our investigations were published in the Psychiatric Quarterly, April 1940, and it would not be fair to Dr. Palmer to go into the discussion of that any further.

Seasonal reversible involutional processes occur in hibernating rodents. In man the involutional period is a phylogenetically, essentially irreversible, catabolic process in which the self preservative forces take precedence over the race preservative or reproductive forces. However, the ovarian or gonadal factor is only one of many influences, including the constitutional endocrine, autonomic, somatic, physiologic, psychologic and personality components.

In regard to estrogenic therapy in the involutional psychosis, with special reference to Stilboestrol, our results in 25 cases are parallel to Dr. Palmer's. There is a type in our series which Dr. Palmer would probably not include in his group of involutional psychosis that appears to react well occasionally to estrogenic therapy, when this treatment is combined with other procedures

which Dr. Palmer has mentioned. This type represents those who develop severe psychoneurotic disturbances or depressions as a result of estrogenic deprivation. They are border-line cases between the well-advanced involutional psychosis and the involutional syndrome without psychosis. They react at times in the same manner as other psychoses superimposed on endocrine dysfunction or somatic disease and improve when the physical factor is allayed. However, large doses (replacement therapy) must be used to prove effective. Small doses (stimulation therapy) may be harmful.

Stilboestrol is a synthetic estrogenic described by Dodds and his associates, Goldberg and Robinson, MacGregor and Winterton in England and by Karnaky in this country. It is structurally described as 4, 4 dihydroxy-alpha-beta-diethyl stilbene. It possesses an open double carbon linkage with 2 hydroxy ethylphenyl groups on either end of the two carbon atoms instead of the closed 4 phenyl linkage of estrone.

Stilboestrol is capable of replacing in every way the action of estrone despite the fact that its molecular structure is entirely different from natural estrone. One mg. of estrone is equivalent to 10,000 international units. Stilboestrol is two and one-half times as potent and is equivalent to 25,000 international units. It is as efficient when administered orally as when given intramuscularly.

We have given as much as 200,000 international units daily for periods from two to three months, tapering off gradually. Despite the wide margin of safety ascribed to the drug, we have observed the toxic effects described by Dr. Karnaky and Dr. Palmer. The medication should be given cautiously and not indiscriminately. Uterine bleeding is induced in a high percentage of cases. Several women have complained of a distressing increase in their libido and at times made sexual advances to doctors and nurses. Two patients attempted suicide. Stilboestrol possesses carcinogenic properties.

Dr. Palmer and his group were among the first to stress the value of preventive psychotherapeutic approach in the early involutional period as well as the use of continuous narcosis in this psychosis. Of special interest are his observations on metrazol therapy. In regard to the other aspects of the therapy, Dr. Palmer's review of his first-hand experience is so adequate that anything that I may have to add would be unnecessary.

Dr. William C. Menninger (Topeka, Kans.).—I want to say a word of praise about this paper, because Dr. Palmer and Dr. Sherman have very conscientiously recorded their failures as well as their successes, and are not overenthusiastic about one thing or another.

These workers have saved us a lot of time. Perhaps most of us have tried at one time or another various sorts of therapeutic attack, and whether we agree minutely as to the diagnostic category or not, at least these workers have given us their impression of what this entity is.

I think narcosis is a great tool for the agitated person, but so far as producing any satisfactory therapeutic results, we do not find as high a percentage as they were able to obtain. I cannot feel that it is quite harmless because once an aspiration pneumonia developed in the patient some hours

after he had eaten. Arthritic changes have concerned us a good deal. While it is desirable for use in certain situations, it is not entirely without danger.

Metrazol seems to be beneficial treatment for the majority of these people. Of all the indications for the use of metrazol this particular group of cases is ideal. The results in our experience have been much better than with the schizophrenic group or with the younger individuals with depressions.

I have lost my nerve, however, about metrazol. I noticed Dr. Palmer bravely reported he had fractured some femurs, and so did we. We also fractured a humerus. I noticed he had the same experience. It made me so afraid that we quit metrazol. We quit it at least until very recently, until we could get curare. Now we have gone back to it stronger than ever, but I felt that the cure was worse than the disease in a certain number of instances, and I am sure that the incident of fractures in the back is higher than was intimated. I am convinced that fractures occur with straight metrazol convulsions in at least 20 per cent of the cases. It is disconcerting to take x-rays before and after treatment and find what has happened, and be aware of the fact that for many, many months we were using it and didn't have sense enough to recognize that the lower back pain might mean that one of the transverse processes was split off.

I was impressed by the fact that so many reports have been made about various therapeutic means which no one else can duplicate. Specifically, this estrogenic substance treatment, in which our experiences parallel exactly those of Dr. Palmer. I don't know how somebody gets 100 per cent cures or 95 per cent cures and we use the same sort of material and try to use the same sort of technic and get about 5 per cent. Either we are not talking about the same entity or else we are not using the same technic. I am encouraged because in this instance Dr. Palmer's results parallel the results we have had.

Dr. Harold D. Palmer (Philadelphia).—We are fortunate to have as discussors two of the authorities on the subject of involutional melancholia. We were much interested in the excellent paper of Dr. Davidoff and Dr. Brew published in the Psychiat. Quarterly of April 1940, and we share their feeling that the similarity of the prepsychotic personality of involutional melancholia to that of the schizophrenic is in some respects a striking one. It was our conclusion in a previous paper that if one were forced to consider the prepsychotic personality in either the cyclothymic-manic-depressive category or the schizoid category we would have chosen the latter designation. The person with potential involutional melancholia pursues a life-long course that is strongly inhibited and introverted, markedly lacking in lability of mood, and furthermore, possesses the asthenic constitution. The schizoid personality has, however, always seemed to us more loosely constructed with obviously disturbed biological and psychological integration and holding together only by reason of successful escape from the stresses of reality. The involutional melancholia personality has seemed to us to possess tightly knit properties giving us an impression of great power and strength. Much of the strength and power goes into repressive efforts and, therefore, the

energies are not productive as are the outflowing energies of the extravert. The fact is that the prepsychotic personality of involutional melancholia belongs to neither of these two but is a separate type recognizable as an almost specific process but belongs close to the obsessive-compulsive character.

Several years ago a paper was published from the Menninger Clinic on the subject of "melancholy and melancholia" which stressed the importance of differentiation between mild transient psychoneurotic and depressive episodes of the climacteric and the psychosis involutional melancholia. As Dr. Davidoff and Dr. Menninger have stated, and as we have pointed out in a previous paper and again stress in this communication, there is still need for careful differentiation between the transient tensions and psychoneurotic manifestations incident to the climacteric and true involutional melancholia. Benefits from proper endocrine therapy will continue to occur in the former, but after the psychotic development the effectiveness of estrogenic therapy seems almost nil and in some instances may be harmful.

We all seem to have the same feeling about the hazards of unmodified metrazol therapy. It seems certain that some form of convulsive therapy will be perfected which will eliminate the greatest dangers. Possibly the electrically induced convulsion is the next step toward a solution. Undoubtedly this era of drastic treatment methods will be looked back upon as unnecessarily reckless, but, like many dramatic but unperfected techniques in the treatment of disease, these methods are in the experimental or unfinished phases of development.

A PSYCHIATRIC STUDY OF PATIENTS MANIFESTING DYSTROPHIA MYOTONICA.*

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Denver, Colo.

Introduction.

Dystrophia myotonica has been defined as a "heredo-degenerative syndrome characterized by (1) myotonia (prolonged contraction) involving especially the muscles of the hands, forearms, head and legs, (2) atrophy of the muscles of the hands, forearms, head and legs in a characteristic pattern, (3) cataract of a peculiar type, (4) testicular atrophy, impotence in the male, frigidity and disturbed menstruation in the female, (5) alopecia, (6) low metabolic rate, (7) emaciation in the advanced stages," [1] and (8) variously described personality changes.

At the University of Colorado School of Medicine and Hospitals, Waring and Ravin,[1-6] during the past four years, have made extensive physiologic, metabolic, genealogic and clinical studies of a series of patients manifesting dystrophia myotonica. These investigators studied six family trees in which the disorder occurred. In these families there were found 18 cases of dystrophia myotonica among 51 members studied. In addition there occurred in these families 6 cases of the disease that were not available for investigation.

Waring and Ravin, in their investigation of these cases, have evaluated and clarified especially the first seven of the eight

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This is VII of a series of studies in dystrophia myotonica made at the University of Colorado School of Medicine.

features characterizing dystrophia myotonica as outlined above. This paper is a preliminary report of the psychiatric examination findings in 11 of Waring's and Ravin's patients that could be studied. Nine of these had dystrophia myotonica. These patients are representatives of 5 of the 6 family trees previously mentioned.

Review of the Literature.

The English, German and French literature on dystrophia myotonica abounds with statements about the personality reactions and disorders associated with the disease. Most of the impressions noted in the literature are at variance with one another—often frankly contradictory, and would seem, except in two or three instances (studies of Maas and Paterson, Berg and Rittmeister), to be arrived at more by causal observation than by specific examination.

In 1886, Erb,[7] in discussing the myotonia in Thomsen's Disease (not to be confused with dystrophia myotonica) suggested that embarrassment, anxiety, fright, mental activity, making errors, etc., often aggravated the muscular phenomenon and the course of the disease. Three years later he added confusion, relaxation and fatigue to his list of aggravating factors, and stated that anger caused improvement. In 1912 Curschmann [8] noted that one of his cases (J. E. B.), of moderate intelligence, was distrustful, inclined to suspect derision and ridicule and was argumentative. Four years later Curschmann,[9] as well as Rohrer,[10] emphasized that psychic changes are frequent in dystrophia myotonica patients, but that no uniform reaction was characteristic of the disease. However, Curschmann,[11] in 1925, wrote that he was convinced that most of his cases showed a varying grade of "psychic inferiority in ethical and affective spheres" and less frequently in intellectual respects. He goes on to say that the patients frequently are indolent, surly, unfriendly, egotistical and occasionally manifest an "euphoric affect." He furthermore stated that "mental ailments" show themselves in individual families as definite familial peculiarities. He found little tendency in his patients to be antisocial and noted that true psychoses were rare. Naegeli,[12] in 1917, in discussing 22 cases, stated that the patients are morose, depressed, apathetic and are "disgusted"; some refuse examination, some are indolent and in general there is a "decrease in intelligence

and mental activity" as evident in the "flabby facial expression and lack of mimicry."

In Fleischer's [13] (1921) 25 families in which dystrophia myotonica occurred, he found only one branch of one family in which so-called "mental defection" existed. In 1925, Frey [14] wrote that "mental inferiority" is characteristic of the disease.

Berg,[15] in 1927, reported one case, that of a 26 year old laborer with dystrophia myotonica, which he studied psychiatrically. The essential features noted by him were intellectual retardation, poor judgment, a monotonous affect and a tendency to be sensitive and distrustful.

Henke and Seegar [16] concluded, in 1927, from their studies of a family in which the dystrophy was traced through several generations, that the incidence of mental defects was no greater than in comparable normal families.

Krause and Schmidt,[17] in 1933, reported 2 unrelated cases, both of which they described as "mentally underdeveloped."

In all of the literature reviewed, only two detailed psychiatric studies of several cases were found. These were the psychiatric studies on 29 patients, reported by Maas and Paterson,[18] in 1937, and those of two series of siblings, 7 in all, by Rittmeister [19] in 1939. Of the 29 persons from families affected by dystrophia myotonica, Maas and Paterson found 17 to be of low intelligence. In eleven of these the intellectual defect was considered to be congenital (four adults having mental ages of 9, 7, 6 and 6) while seven had been backward in school. The remaining six had shown "normal" performance in school but had since deteriorated intellectually as indicated by defective retention, recall and grasp. These investigators feel that mental changes "almost always accompany much muscular wasting." Six of the 29 persons examined presented personality reactions resembling "classical" mental disorders, one being diagnosed schizophrenia, one had delusions that his wife was unfaithful, one had "fits and had become somewhat demented," one was of a hysterical make up, and two were chronically elated. They report that "a characteristic temperament was apparent in nearly all the cases whether there was mental deterioration or not." This consisted of a "persistent and almost morbid cheerfulness, mild generosity and a lack of drive and initiative."

Rittmeister based his analysis of the mentally integrated performances of his cases on mental status examination, portions of the Binet-Simon intelligence test and the Rorschach experiment. He concluded that these patients "were not simply debile persons or reduced in intelligence, but they showed a peculiar mixture of organic, spiritual and mental deformity, as it occurs in a number of heredo-degenerative diseases." One was congenitally intellectually retarded, one was on the same basis somewhat retarded but showed also evidence of intellectual deterioration. Three more cases were retarded but not "weak minded." Most of the patients handled abstractions poorly. Rittmeister feels that in "some" of his patients the intellectual retardation was "closely associated with physical" defection. As to temperament, this investigator states that all of his patients were reticent (often taken for moodiness), moody, declining, unfriendly and showed a "lack of impulsiveness and low affective dynamic." Only one case, a girl, was inclined to be hilarious. No "psychopathic unstableness" was noted.

Scope of this Study.

The personality and psychiatric study of the eleven patients, as carried on at the University of Colorado School of Medicine, besides the physiologic, genealogic and clinical investigations, consisted of: a history of personality development, general performance, school, vocational and social adjustment, etc., a routine mental status examination, the Stanford revision of the Binet-Simon intelligence test, classification of figures, pictorial and verbal absurdity tests, as outlined by Hausmann,[20] the solving of concrete and abstract problems, and the Rorschach experiment. With the exception of the "testing of limits" in the division of the mental status dealing with the content and topical processes, and after the Rorschach experiment was concluded, all test questions and test situations were kept uniform.

Case Material.

The case material of this study consisted of 11 patients, representatives of five family trees (see Figs. 1, 2, 3, 4, 5).

Of the eleven cases, 8 were men and 3 were women. One of the men and one of the women in one family (E) in which 5 siblings

B. FAMILY

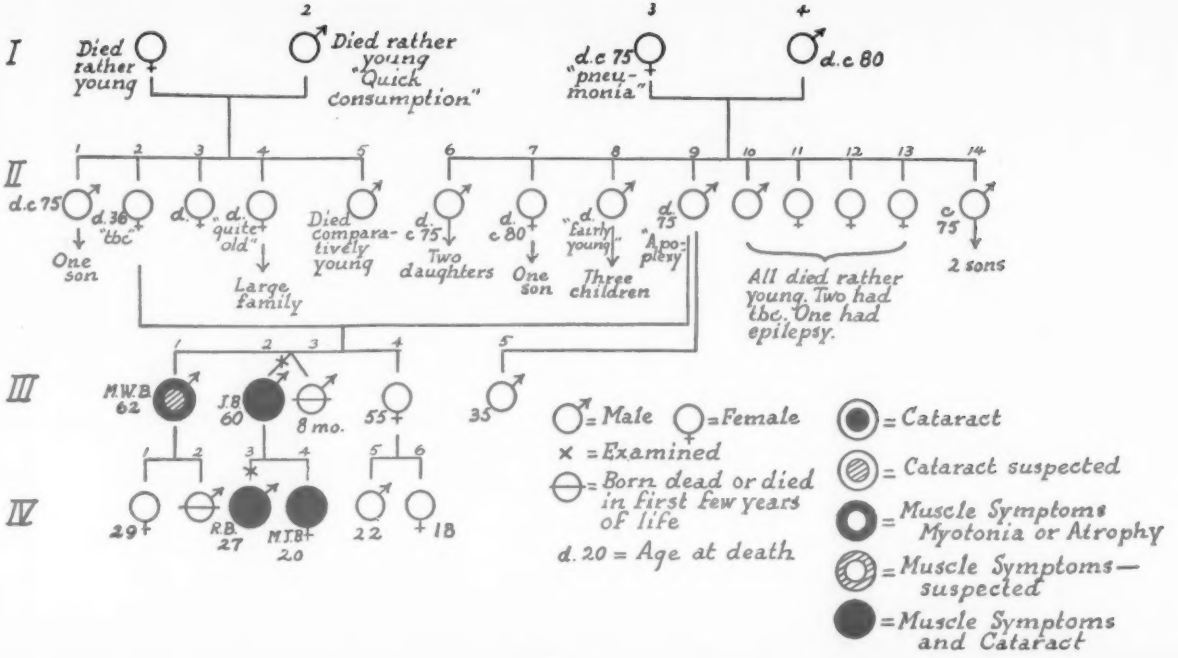

FIG. 1.

FIG. 1.

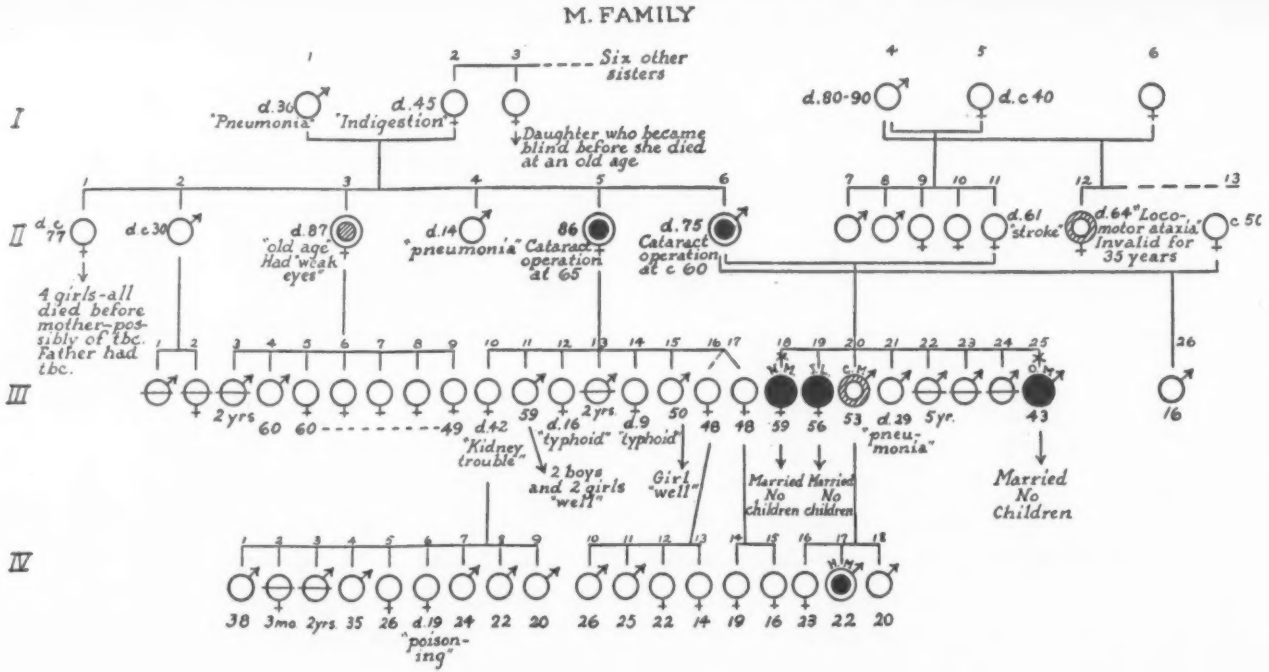

FIG. 2.—(Legend as in Fig. 1.)

Pf. FAMILY

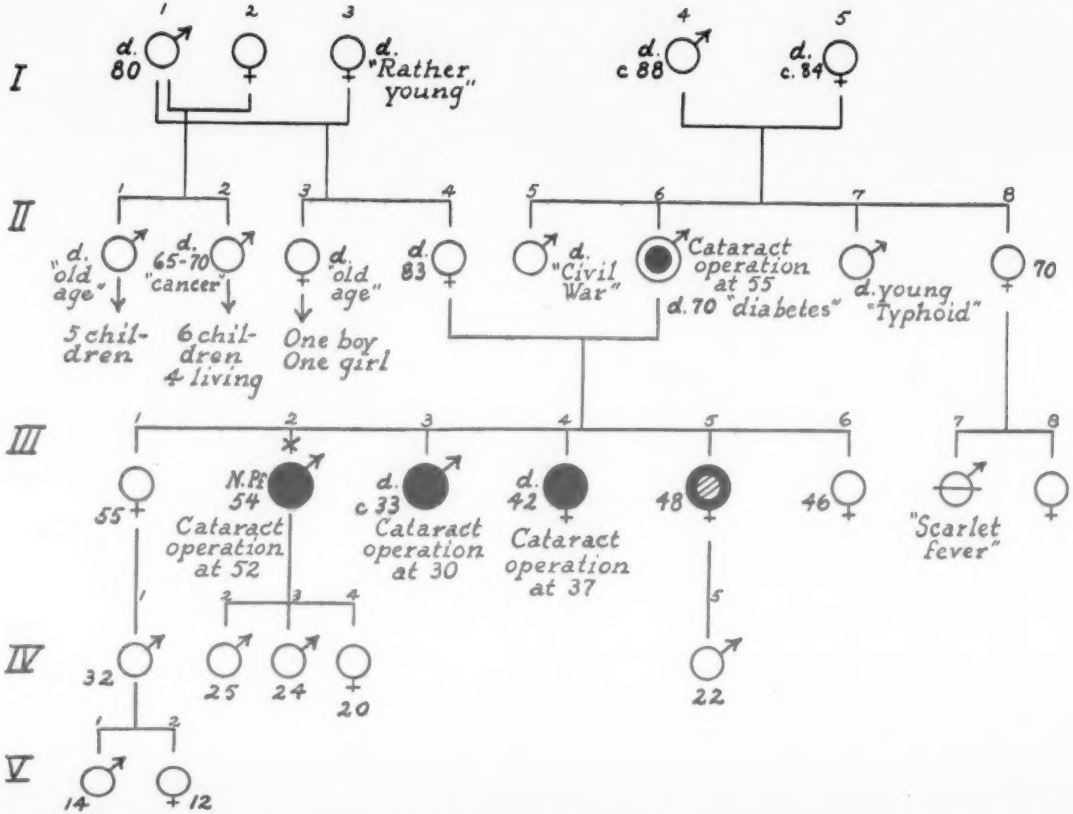

FIG. 3.—(Legend as in Fig. 1.)

D. FAMILY

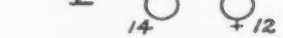

FIG. 3.—(Legend as in Fig. 1.)

D. FAMILY

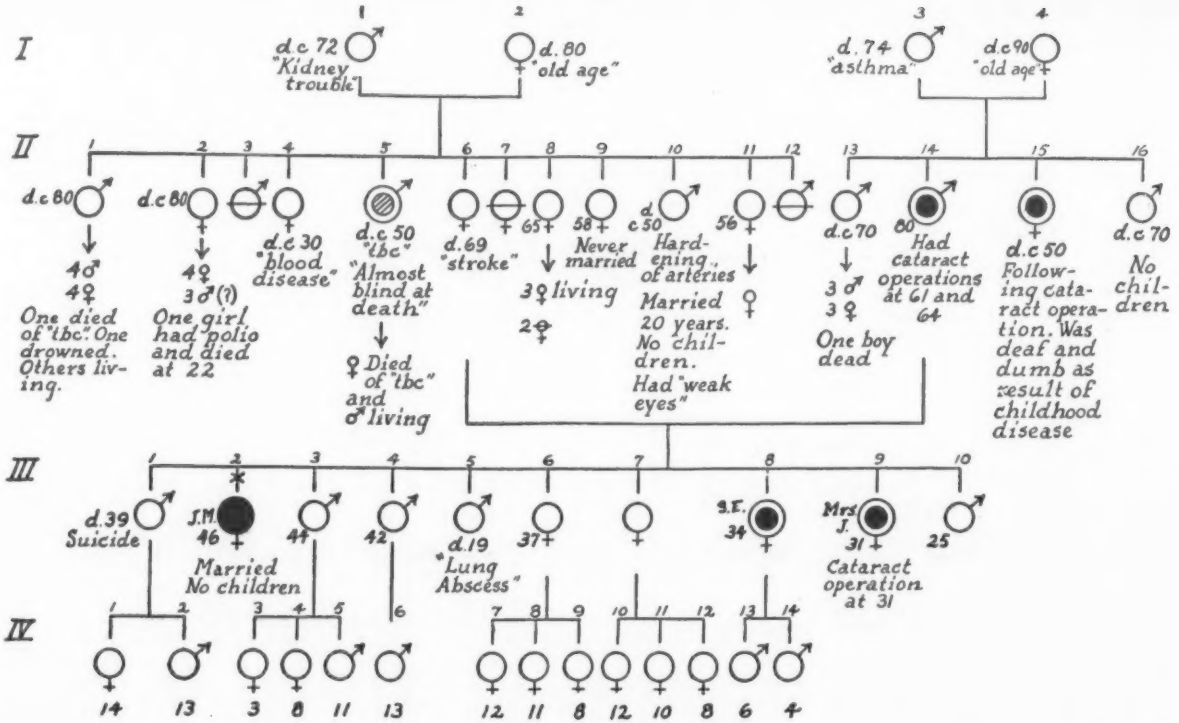

FIG. 4.—(Legend as in Fig. 1.)

E. FAMILY

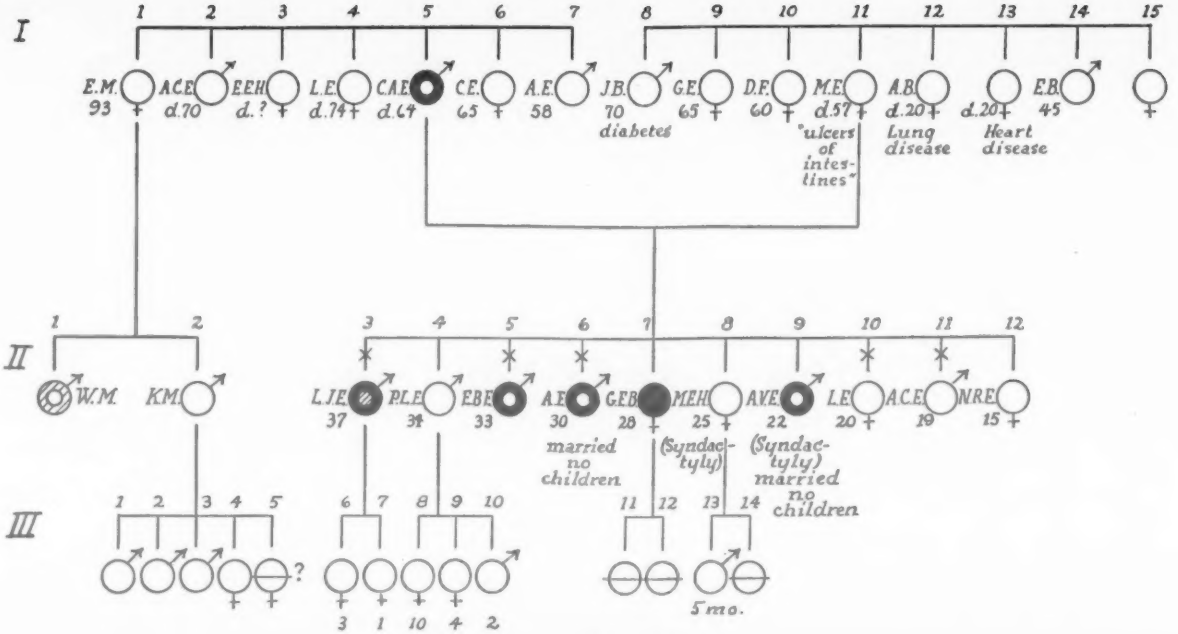

FIG. 5.—(Legend as in Fig. 1.)

were examined were unaffected. These eleven cases were divided as to families as follows: One man (J. B. III 2), aged 60, and his son (R. B. IV 3) aged 27, represented one family (B); one woman (N. M. III 18), aged 59, and her brother (O. M. III 25), aged 43, represented a second family (M); one man (N. Pf. III 2) aged 55, was the only one of several studied psychiatrically in the third family (Pf); one man (J. M. III 2), aged 46, was the only representative of the fourth family (D). In the fifth family (E), three affected brothers (L. J. E. II 3, aged 37, E. B. E. II 5, aged 33, A. E. II 6, aged 30), one unaffected sister (L. E. II 10), aged 20, and one unaffected brother (A. C. E. II 11), aged 18, were examined.

Personal History Data of Cases.

The personal histories and available records of the development of the patients indicate that there were no abnormalities in birth, no marked retardation in biological developments, and no pertinent somatic ailments other than dystrophia myotonica. There was no tendency for these patients to show any so-called "neuropathic traits" or special patterns of childhood behavior. Two patients were enuretic until 7 and 9 years of age (J. B. and N. Pf. respectively), one (J. B.), having few playmates, was considered a day dreamer and one (N. M.) reacted to the strict discipline of her parents with occasional tantrums. All members of the E. family, from childhood on, have been sensitive to the ever low social and economic level of the family as a whole. When faced with possible failure, the E's have retired and rationalized and talked with and among themselves as to their real worth. None of the patients has had to contend with any pertinent physical disabilities and illnesses other than dystrophia myotonica. One patient (R. B.) managed to "float" through three regular years of college, one (N. Pf.) graduated from high school, one (J. B.) completed one year of high school, one (O. M.) "got by" eight grades of country school, one (J. M.) did average work through seven grades of country school and one (N. M.), was unable to go farther than the fourth grade. Of the E family, the two unaffected members passed the seventh grade without failure. Of the three affected male members of this family, after many failures, two (E. B. E., and A. E.) retired from school at the sixth grade as soon as they were old enough to escape the truancy laws, and the third (L. J. E.) quit in the sixth grade because of discouragement that arose as a result of lack of opportunity to attend regularly. This record would possibly indicate that of the affected patients 3 (N. Pf., J. B., and R. B.) were intellectually endowed with not less than average capacities, that 3 (O. M., J. M., and L. J. E.) were not less than dull normal in intelligence and that the remaining 3 (E. B. E., N. M., and A. E.) were innately poorly endowed. The educational accomplishments of the two unaffected members (L. E. and

A. C. E.) of the E family would indicate their intelligence as being no greater than dull normal. Interestingly enough, the scores of these patients on the intelligence test given, compared quite accurately with these school performance records except in one instance. The patient N. Pf., a professed high school graduate and having a work record that would seem to corroborate this achievement shows now a mental age of 11 years, 6 months (I. Q. 71), with a base line at 8 years, which would be indicative of a dilapidation in some intellectual assets.

There was no evidence in the personal histories of these cases that there has been any decline in vocational achievement and adjustment nor in social status except that which can be adequately explained by physical disability caused by dystrophia myotonica. Any marital difficulties that have arisen have occurred in the instance of the male members only, and then only as a result of their impotence, an aspect of their disease. There is no history of antisocial behavior on the part of any member of the series.

Findings on Mental Status Examination.

On direct observation, all cases not living in close association with affected siblings, (*i. e.*, all excepting the E. family) manifested no special pattern of reactivity and behavior other than what on casual observation, due to their posture, facies and muscular atrophy subsequent to the disease, could be mistaken for apathy, depression and/or general intellectual enfeeblement. The interest and cooperation of most of them were easily obtainable,—the women (N. M., and J. M.) were more confident and self-assured than the men. One man (N. Pf.) was inclined to braggadocio and forced optimism, but spontaneously admitted as the examination proceeded that he had always been inclined to "stretch a point" in his own favor and to put his "best foot forward." Checking this man's behavior of the last few years, however, there are indications that his standards have relaxed some in that he has done considerable begging and is made irritable easily. The behavior of the E family—the members of which were all closely associated in their homes and community—was interesting. They were all on the defensive due to a sensitivity to their disabilities. They said that they had long realized vaguely that their affliction was hereditary in nature, that they were different from others and that they were apprehensive of the examination revealing additional deficiencies.

As a group, the speech of all the patients was characterized essentially by a montonous "nasal" tone. The stream and flow of

talk was in keeping with the intellectual caliber of the patient and showed in no instance any evidence of a formal disorder.

No leading primary mood disorders were demonstrable in any of the cases. All of them felt discouraged as to ever recovering from their affliction, discontented with their inability to maintain their previous work levels, and the married male patients often reacted with momentary sadness and lamentation when they considered the plight of their families.

Careful consideration of the content and topical processes of these patients revealed nothing other than some puzzlement as to the nature of the dystrophia myotonica and worries over current economic problems. One woman (N. M.) showed some evidence of being inclined to obsessive thinking when under strain. The E. family as a whole felt that the community in which they lived considered them inadequate and their disabilities as possibly being due to some moral transgressions. To this, resentment was expressed, as well as a need to prove worthy of their social security rights which they were wont to demand. The four younger members of this family felt "lonely" and "lost" without the guiding hand and advice of their father.

The sensorial examinations elicited no disabilities not explainable by low intelligence of the retarded patients, except in one case, N. Pf., aged 55. This man, with a good previous record as a railroad conductor and insurance adjustor, showed considerable deficiency in recent memory, retention and calculation, which he tried to conceal with bluffing and lame excuses. This, along with the discrepancy between his past educational and work achievements and his present intelligence test performance, instability and apparent softening of his ethical standards, could very well indicate some deterioration.

All of the patients evidenced surprisingly good judgment. In fact, when all factors and circumstances related to each case were considered, the good judgment shown by these patients was outstanding. In considering why they should be so efficient in this aspect of personality government, the conclusion was that through years of disability, striving to be appreciated and to maintain prestige and to exist, they had profited well from experience. The insight of all of the patients was adequate and in no case lacking or distorted.

In general, it can be said that the study of the personal histories of these patients and the mental status examinations failed to reveal any patterns of personality organization, behavior trends or reactions either characteristic of the disease syndrome, *per se*, or that could be correlated with the degree of myotonia and/or muscle atrophy. So far, in the study, evidence of an organic personality change was found in only the case of the 55 year old former railroad conductor (N. Pf.).

Intelligence Test Findings.

The intellectual capacities of each of the patients were determined by the use of the Stanford revision of the Binet-Simon intelligence test. The intelligence ratings of this group of patients ranged from an I. Q. of 107 to one of 67, the average for the group being 80. The members of the E family are all retarded, but as to their I. Q. ratings, they are fairly well distributed in the group. When the mental age, I. Q. ratings of the patients, as well as their failures to cope with the various performances entailed in the test, are plotted with the patients arranged as to degree of intelligence, it is impossible to correlate any intellectual retardation or specific intelligence disability with the age factor except possibly in the case of the ex-railroad conductor (N. Pf.). Likewise, when these data are plotted, the patients being arranged in order of the severity of the dystrophia myotonica shown by them, it is not possible to corroborate the findings of other investigators that the more the muscular atrophy and disability, the more the intellectual retardation.

Results of Tests for Thinking Difficulties.

Pictorial and verbal absurdity tests as outlined by Hausmann [20] were given the patients in an attempt to designate any "specific thinking" difficulties. When the scores attained by the patients on these tests are plotted with the patients arranged in order of intelligence and in order of degree of physical disability it can be shown that failure to realize either pictorial or verbal absurdities does not correspond to the severity of the dystrophia myotonica and that if any specific thinking difficulty is demonstrated by these tests it is quite in keeping with the intellectual endowment of the respective patients. In further studying

these patients from the point of view of possibly eliciting any particular disorders in their thinking, their responses to proverbs, their ability to handle simple concrete and abstract problems and to classify geometric figures as to size and shape were studied. They all, without exception, did miserably in the classification of figures and had considerable difficulty with abstractions as did Rittmeister's cases. Innate low intellectual endowment probably accounts for this deficiency in 6 patients (J. M., N. M., E. B. E., A. E., L. E., and A. C. E.), and this, or more likely deterioration, accounts for N. Pf's. failure to accomplish these problems. No explanation is as yet at hand for the failure of the 4 patients (O. M., L. J. E., R. B., and J. B.) having mental ages of over 13 years, 9 months, unless the type of life led by them never required the development of such aptitudes.

Rorschach Test Findings.

The Rorschach test revealed many interesting data having to do with the organization and reactive capacities of these patients, the details of which cannot be elucidated at this writing because of the limited time and space allowed for this presentation. The reactions evoked from these patients by this test indicate that they do not conform to any particular basic type of personality organization. The intelligence of the patients as estimated from the test responses corresponds closely to the intellectual attributes as measured by specific tests. The emotional reactions of the patients were heterogeneous and the type of "control" manifested by them was varied except in one or two respects in the E. family. The members of this family showed, in common, a tendency to "constriction" as indicated by the number of *form* answers. In many ways this can be accounted for by the personality immaturity and the intellectual inadequacies of several of the patients of this family. The realization of their disabilities and possible apprehension lest they show any further defect would likewise tend to produce this effect. It also might well occur as a manifestation of a family characteristic. It is more probable, though, that this failure is the result of a family which, by virtue of its social situation, type of understanding of its affliction, etc., has evolved a cautious approach, endeavoring to make as good an impression as possible

by attending to what is obvious and not running any risks that might be involved in allowing the imagination to be more free in looking for and noting unusual items. This is substantiated in the general *approach* to the test used by members of this family.

The Rorschach experiment indicates that none of the patients has developed any definite psychoneurotic or psychotic reactions in his attempts to cope with life.

The low intellectual level of the group as a whole is most apparent and this, along with the immature type of personality non-organization, makes it difficult to say that dis-organization in the form of organic deterioration has definitely occurred in some of the subjects. In an attempt to do this, the ten Rorschach criteria indicating organic personality disorders as outlined by Piotrowski [21] were applied to the Rorschach performances of these cases.

Piotrowski states that any case, in which 5 or more of these signs are present, very possibly is suffering as a result of an organic type of personality disorder.

As a group, the average number of these signs present was 2—a number quite within the range of the average group with the intellectual level of this series of people. One case (O. M.) showed 4 of these 10 signs, two cases (J. M., and J. B.), 3 signs, and the rest showed either 1 or 2 such signs. When the patients were arranged as to the severity of their dystrophia myotonica, the first 5 cases (J. M., O. M., J. B., N. Pf., and N. M.) showed an average of 2.6 signs ranging from 1 to 4. The 4 less severe cases showed an average of 1.7 signs and the two unaffected cases each demonstrated but 1. When the cases were arranged as to the duration of the dystrophia myotonica (23 years in J. M., to 7 years in the cases of N. M. and L. J. E.) about the same incidence of these signs of an organic reaction was existent.

Therefore the Rorschach test findings might be said to suggest only that in the more severe and prolonged cases of the disease there are a few more indications of deterioration than in the less severe and less prolonged cases. In none of the cases were there any Rorschach signs of personality deterioration having occurred—definite enough to make it possible to say that mere aging and general intellectual inadequacy cannot explain them. In the case of the ex-conductor (N. Pf.), however, the general personality

picture shown by the Rorschach test indicates some disorganization and does thereby corroborate his other data.

General Discussion.

The literature describes various temperaments more or less pathognomonic of dystrophia myotonica. The study of the series of cases, here presented, would seem to indicate that a distinction should be drawn between the apparent *"temperament" of the patients in the illness* due to their physical appearance, their understanding of the disease and the economic status coincident with the physical disability and the *real temperament of the patients.* No real depression was noted in these cases. True, they looked depressed and apathetic because of the degree and distribution of muscle atrophy resulting in the sad, "hatchet" facies, the stooped posture and the slowness of movement. Superficial depression often appeared on the basis of the change in their adaptability to work, the social factors felt by the patients as due to this hereditary illness, their futility and discouragement. No elation was evident in any of the cases, though several were inclined to "laugh in the dark," as it were, and to present a pseudo-optimism as a compensation for the anxiety they felt. It has been said that patients so afflicted have a lack of drive (Maas and Paterson). None of these patients demonstrated this. The urge and drive was unchanged in all the patients. To initiate and follow out the drive in effective activity was limited due to the muscular atrophy and weakness, the fatigability, etc. Likewise, withdrawal was only apparent when the patients were forced to do so by their physical disability and concomitant circumstances. The withdrawal, when it occurred, was not a personality compensatory and protecting phenomenon. It was forced upon them by the physical changes and was resented by all of them.

The failure of the patients to show more reaction than they do to their plight is to some extent explainable by the intellectual retardation in some of the cases and perhaps by the possible organic personality change in the one patient (N. Pf.). On analysis there were two perceptible factors as to why they did not react more profoundly: (1) the onset of the difficulty is insidious and the development of it gradual over a period of years. There is, as a result, time for the person to readjust to the slow change

in his social and work status, if such occurs. The physical changes and modifications in bodily configuration take place so slowly that the patient is at first unaware of them and when he does become gradually cognizant that he is different he has already accepted them without much concern. (2) All of the patients have had for years a vague realization of the occurrence of the syndrome in other family members. Through experience, the patient, although he realizes that the difficulty is familial and therefore likely inescapable, nevertheless believes that it is not lethal and therefore he is not so inclined to be anxious and afraid. This study revealed no prevailing type of personality organization or temperament common to the patients with dystrophia myotonica.

Intellectually, most of the cases, especially those of the one family (E.), were poorly endowed. Information concerning the social and vocational levels of the antecedents of all of these families is to the effect that there has been very little if any change in intellectual status of the families from generation to generation. No correlations could be made as to the occurrence of intellectual deterioration in relation to either the severity of the disease or to the duration of it.

One patient only, a man of 55 (N. Pf.) presented evidence of a personality reaction of the organic type.

With these exceptions, no particular psychopathology was evident in any of the patients of this rather small series.

Summary.

1. Nine affected and two unaffected members of five families in which dystrophia myotonica has occurred were studied psychiatrically in conjunction with other detailed clinical and research investigations at the University of Colorado School of Medicine.

2. The literature dealing with the personality reactions associated with the disorder is reviewed, and

3. The results of the study, which included a history of personality development and activity, mental status, physical and neurological examinations, intelligence testing, tests for thinking disabilities and the Rorschach experiment, are reported and an attempt at interpreting them is made.

BIBLIOGRAPHY.

1. Waring, J. J., and Ravin, Abe: Dystrophia myotonica. International Clinics, Vol. III, Series 48, pp. 89, 1938.
2. Ravin, Abe, and Waring, J. J.: Studies in dystrophia myotonica: I. Hereditary aspects. Am. J. Med. Sc., 197: 593-609, May, 1939.
3. Waring, J. J., and Ravin, Abe: Dystrophia myotonica. Trans. Amer. Clin. and Climatological Assoc., 1939.
4. Ravin, Abe: Myotonia. Medicine, 18: 443-503, Dec., 1939.
5. Ravin, Abe, and Waring, J. J.: Studies in dystrophia myotonica: its nature and occurrence. Annals Int. Med., 13: 1774-1783, Jan., 1940.
6. Waring, J. J., and Ravin, Abe: Studies in dystrophia myotonica: II. Clinical features and treatment. Arch. Int. Med., 65: 763, April, 1940.
7. Erb, Wm.: Die Thomsen'sche Krankheit (myotonica congenita) Studien, Leipzig, F. C. W. Vogel, 1886.
8. Curschmann, H.: Ueber familiäre atrophische Myotonie. Deutsche Ztschr. f. Nervenh., 45: 161, 1912.
9. Hauptmann, A.: Die atrophische Myotonie. Deutsche Ztschr. f. Nervenh., 55: 53, 1916. (Quotes Curschmann and Grund.)
10. Rohrer, K.: Ueber atrophische Myotonie. Deutsche Ztschr. f. Nervenh., 55: 242, 1916.
11. Curschmann, H.: Zur Nosologie und Symptomatologie der Myotonischen Dystrophie. Deutsche Arch. f. Klin. Med., 149: 129, 1925.
12. Naegeli, Prof.: Atrophische Myotonie. Mü. Med. Wo., II, 1637, 1937.
13. Fleischer, B.: Ueber die Vererbung. der Myotonischen Dystrophie Verhand. d. Ausserord. Tagung. d. Opthal. Gesellsch., 169, Aug., 1921.
14. Frey, H. C.: Beitrag zur Myotonischen Dystrophie. Arch. f. Rossen— u. gesselsch. Biol., 17, 1, 1925.
15. Berg, W.: Zur Kenntnis der Myotonischen Dystrophie. Deutsche Ztschr. f. Nervenh., 98: 29, 1927.
16. Henke, K., and Seegar, S.: Ztschr. f. d. ges. Anat., Part II, 13, 371, 1927.
17. Krause, F., and Schmidt, K.: Kombinationsformen der Myotonischen Dystrophie und Neuralen Muskelatrophie. Deutsche Ztschr. f. Nervenh., 131: 43, 1933.
18. Maas, O., and Paterson, A. S.: Mental changes in families affected with dystrophia myotonica. Lancet, 1: 21, 1937.
19. Rittmeister, J. F.: Psychische Befunde bei einem Geschlecht mit Myotoner Dystrophie. Schweiz. Arch. f. Neurol. u. Psych., 18: 329, 1937.
20. Hausmann, M. F.: A method to objectively demonstrate thinking difficulties. Am. J. Psychiat., 13: 613-615, 1933.
21. Piotrowski, Z.: On the Rorschach method and its application in organic disturbances of the C.N.S. Rorschach Research Exchange, 1: 23-39. Nov., 1936.

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DISCUSSION.

Dr. Louis Casamajor (New York City).—Dr. Billings and Dr. Ravin have put before us some very interesting material covering the relationship between muscular disease and personality. There is much conflicting opinion on this subject in the literature and most of it consists of generalities based on insufficient study and hunches. It is cheering to see such a careful, accurate study as this one.

Personally I have had almost no experience with dystrophia myotonica but I am interested in it as a purely muscular disease. In observing many cases of progressive muscular dystrophy and myasthenia gravis I have been impressed with the fact that no specific personality alterations go with these diseases. Many of us have believed that there is a definite poliomyelitis personality of kindliness and geniality. Chorea, on the other hand is so often accompanied by a querulousness that that symptom is almost as diagnostic of the disease as are the involuntary movements. I have never felt that these psychic manifestations are an essential part of these diseases and dependent on the same causes as are the muscular symptoms. The paralyses and the handicap, up to helplessness, of poliomyelitis accounts for the frank open type of personality reactions that most of these patients adopt. They, and especially the children, react in a kindly manner to an environment kindly and sympathetically inclined toward them. In chorea the essential and extreme discomfort in the muscular system is the basic factor in determining the patient's disposition which usually disappears with the passing of the chorea.

Drs. Billings and Ravin have added some more evidence to show that any personality disturbances in muscle disease is dependent much more on the environment than on the disease. The handicap, the sensitiveness and self-consciousness of the patients in their contacts with working men and women have called for adjustments to a none too friendly reality which each patient has had to make as best he can with the intellectual and emotional endowment he possesses. The present paper shows through psychiatric data how true this statement is.

MICROCEPHALY.*

By CLEMENS E. BENDA, M. D.

Of the different clinical groups of mental deficiency, microcephaly is one of the most important. Between a slight degree of arrest of growth and a striking decrease in size of the brain, many intermediary forms are found. Meticulous case study indicates that the microcephalic type is produced by various etiologic factors which may act on the growth of the brain and the skull.

The clinical type is reflected in the pathology, and earlier investigators placed emphasis upon the manifold pathologic pictures which may be encountered in the study of microcephalic brains. It seems desirable to distinguish between cases of microcephaly which represent a primary mental defect, and those which are due to accidental factors. There is little hope of controlling malformation, but increasing knowledge of accidental cases may eventually lead to prevention of some of those accidents.

In a recent study of the clinical picture of hydro-microcephaly, J. E. McClelland [1] gave valuable suggestions for the clinical recognition of this type of microcephaly and also suggested the possibility of determining the type of microcephaly by encephalography. Clinical understanding may be increased through study of the pathology. The following cases will illustrate the two etiologic types to which I have referred: the first, an example of a primary developmental defect and the second, of one due to accidental factors.

In the second volume of The Waverley Researches,[2] E. E. Southard and O. J. Raeder described one case of agyria which they called the "loaf of bread" brain. My first case is of this type.

Case I.—Little is known about the family except that the father had been in prison. He was 33 years old at the time of birth of the child, and a laborer

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*Read at the ninety-sixth annual meeting of The American Psychiatric Association, Cincinnati, Ohio, May 20-24, 1940.

From the Research Department for the Study of Mental Deficiency, Wrentham State School, Wrentham, Massachusetts, and the Department of Neuropathology, Harvard Medical School, Boston, Massachusetts.

by occupation. The mother was 37 years old. There was one brother in 1926. There is no apparent mental retardation in the brother whose school work is reported as satisfactory. The second child was our patient born Nov. 5, 1929. The last child was a sister born in 1933. No information is available about her. There was one stillbirth. According to the father, it was due to the fact that the mother had a blood transfusion at the time and the baby died in utero following the transfusion. Why the blood transfusion had been given is not stated.

Our patient, Henry, was born at full term—breech presentation. When he was six months of age, he was recognized as peculiar because of his inability to hold up his head, and because his eyes turned in. He was afflicted with paralysis of the extremities and his right foot was clubbed. At the age of eighteen months, he endeavored to say "mama" and "papa."

In 1931, the patient was in a hospital because the doctor questioned a cerebral injury. The report of the hospital stated, "this patient evidently had a birth injury." X-rays showed slight gap in the lamina of the fifth lumbar and first sacral vertebra posteriorly. Ventriculograms showed markedly dilated ventricles and a considerable amount of air scattered over the cortex demonstrating marked cerebral deficiency. Diagnosis: Birth injury—feeblemindedness—nutritional anemia—cerebral deficiency.

One year later, November 1932, he was examined in the outpatient department of the Wrentham State School. He was a delicate, poorly developed child of three years. He had double internal strabismus. Speech: no words, only a few sounds. Face: ovoid, high, rounding forehead. He was unable to hold up his head. Lay on back and rolled from side to side. His mental age was five months.

He was admitted to the Wrentham State School, June 14, 1933. It is of great interest to note his mental development at that time. "He passed all of the six months tests with no difficulty. Of the one-year group, he was able to pass the imitation test. He did not sit or stand without support. He was able to say "mama" and "papa." He was very quiet, smiling and happy. He could not reach well for objects but would make tentative movements toward them. He enjoyed shaking the rattle and would laugh and smile when doing this. He easily tired. After he sat upright for a time, he seemed to want to lie back in a prone position."

The physical examination at that time revealed a poorly developed, fairly well-nourished male child of three years: "Somewhat anemic. Unable to sit or hold up his head. Head round on the right side and flat on the left. Right lower extremity is small and more undeveloped than the left. Right foot somewhat spastic. Left foot flail-jointed. This was considered as probably due to birth injury. Head measurements: Circumference 18 inches, width 9¾ cm., length 12½ cm."

A number of epileptic seizures were observed during the following years. In the first year, there were two or three a month. In the month of December 1934, thirteen seizures were reported. In October 1936, twenty, and in December 1936, forty-six were noted. In August 1937, Henry had sixty-six epileptic seizures during the month and continued to have seizures every day

afterwards until 1938, when the number of seizures fell to one or two a month. In 1939, the number of seizures increased again, twelve to fourteen being reported monthly.

A mental test in December 1938 at a chronological age of 9 years, 1 month, gave a mental age of only one month. He seemed to look around a little but his eyes were staring and he had a marked nystagmus. He held the small rattle for a long time, but he did not seem to notice when it was taken away from him. He lay with his body stretched out and was unable to balance his head or sit up without support. He did not follow an object with his eyes.

The child died at an age of 10 years, 1 month. The body length was only 107 cm. and the physical appearance that of a child of six years. The length of the skull was 16 cm., the width 12.6 cm. The right side was flattened, especially upon the right occiput. The face was asymmetrical, the right side appeared longer than the left. The ears were well formed, the hair was thick. The teeth showed a marked degree of irregularity with two parallel sets of teeth. The testicles were not descended. The body organs were small and underweight but in proportion to the small size of the body. No special developmental disorders were recognized. After opening the skull, the dura was found to be firmly adherent to the calvarium. Between dura and brain, there was a space of about half an inch filled with spinal fluid. The brain weighed 1029 grams and its volume was 1044 cm.^{3} The inferior surface of the brain showed almost complete absence of normal fissuration upon the temporal and the lateral parts of the frontal lobes. The gyrus rectus showed a high degree of fissuration with microgyria. In a lateral view, the sylvian fissure appeared well developed but the central sulcus was only slightly indicated and some of the other main fissures were almost absent. Upon the convexity, the sulcus frontalis superior appeared well developed, extending backward to the parietal lobe. The parts near the longitudinal fissure showed fissuration with small microgyric convolutions.

The appearance of the lateral ventricles was the most outstanding feature in a horizontal section through the hemispheres. The left lateral ventricle measured 25 mm. in width and 45 mm. in length; the right, 35 x 45 mm. The cortical wall above the lateral ventricles, forming the parietal and temporo-occipital regions, measured only 10 mm. in width. The medial wall was a few millimeters thicker. The lateral cortical walls, from the temporal opercula to the occipital pole did not show fissuration. On the inside, the calcarine fissure was indicated by a short shallow sulcus but other parts of the medial occipital surface did not show furrowing. The basal ganglia were normal in size and well marked as also were the capsula interna and the claustrum. The insula had no sulci on either side. Both frontal lobes were incompletely separated in the midline. The corpus callosum was absent but a protoplasmic bridge connected the frontal hemispheres. There was only one deep fissure in the frontal lobe of each side separating the gyrus rectus from the lateral part of the frontal lobe. This sulcus, which was probably the orbital sulcus, cut deeply into the inferior surface of the frontal lobe. The brain tissue, medial to the orbital sulcus was furrowed

to a great extent, revealing microgyria, whereas the flanks of the frontal lobes were entirely without fissuration. The pathologic architecture of the cortex of the walls of the lateral ventricles was recognizable even with the naked eye.

Microscopically the ependyma of the lateral ventricle was almost absent, only partly preserved at the caudal end of the ventricle and upon its medial surface. The walls of the ventricle were formed by a fibrous meshwork. Beneath this meshwork, a rather dark zone, extremely rich in spongioblasts was recognizable. Outside this layer, the bundles of the optic radiation were readily noted, running from the striatum and thalamus toward the occipital poles. A peculiar finding in the white matter, immediately lateral to the optic radiation, was the presence of islands of nerve cells in a line parallel to the ventricle. The cortical gray matter measured 4 mm. in the outside wall and up to 8 mm. in the medial wall. The cortical differentiation into six layers was absent, the nerve cells were arranged in columns or islands, forming cell-centers which were separated from each other by stripes of white matter containing small glia cells. The whole appearance of the gray matter was mottled, the outside ruffled, the surface being covered with small protuberances. No sulci were developed, resulting in the condition known as macrogyria. The cortical layer was lined by the limitans meningea, a small fibrous meshwork with several layers of fibroblasts.

The differentiation in the frontal lobes had progressed further, especially in the mesial parts; the white center was broader and the cortical stratum smaller. On the mesial surface the cortical stratum showed almost a normal appearance; the nerve cells, however, being small in size. The orbital sulcus was lined by a wall of gray matter which was thrown into villous-like folds, each fold containing a central core of the limitans membrane. These loops indicated incomplete gyri, the development of sulci being arrested. This condition has been termed "microgyria interna." The surface of the flanks of the frontal lobes was ruffled. At the anterior pole, the cortical stratum measured 12 mm. in width; at the lateral surface it measured more than 7 mm. This gray matter showed the same mottled appearance which was previously described. The nerve cells were not equally distributed but formed waves and so-called "germinal centers."

Concerning the glia, it might be mentioned that there were only oligodendroglia cells present and no astrocytes or fibrous glia formation was recognizable. The vascular system showed slight perivascular enlargement and necrosis. There was a slight glia reaction around the vessels and round cell infiltration into the perivascular spaces but these processes did not amount to an extent found in infectious diseases. This reaction may be related to the frequent epileptic seizures which occurred during the last years of life.

Case II.—The second case is that of a small microcephalic girl who was an only child. The father, 30 years of age at the time of the birth of the child, was an intelligent business man who had been operated on for goiter three years before the patient was born. The mother was an intelligent woman of 26 years of age and was in good health until the seventh month of pregnancy

when she had a considerable degree of swelling of the legs and arms. No stillbirths or miscarriages were on record.

The patient was born in a hospital and a letter from this hospital states, "Asphyxiation after delivery and very little breathing for three hours after which time normal breathing was established. Fontanels never showed increased tension or bulging. Slight spasticity of the arms and legs noted during the first week which has increased since the baby has grown stronger. The baby cries now but not normally and takes 2 ounces of feeding with much patience on the nurse's part.

"When first seen, the baby's physical examination was as follows: head circumference 13¼ inches; length of body 20 inches. The baby's general appearance was lethargic; the baby was not responsive; the eyes showed contracted pupils. There was spasticity of the upper and lower extremities. Knee jerks were obtained. Labor had been prolonged and the delivery complicated by a prolapsed cord. Much asphyxia occurred before the baby could be delivered with forceps."

Three weeks after birth, she was admitted to a children's hospital, chief complaint, spasticity. The baby's condition gradually improved as far as respiration was concerned but she became more and more spastic. On examination, "She was a well-developed and well-nourished child. Head, normal: ears and eyes negative; there was a marked generalized spasticity. Baby acted like a decerebrate animal. Lumbar puncture was repeated and showed normal fluid. It was felt that either a very diffuse cerebral destruction, secondary to intracranial injury, or a large hemorrhage in the region of the medulla was present. Diagnosis: Intracranial Injury. Spastic Paraplegia."

About two months after birth, she was seen by an oculist who found hyperopia in the left and right eyes, vitreous of each eye very cloudy; question of intraocular hemorrhages in both eyes. Two months later, vitreous clearing but no pupillary reaction and no evidence of sight. At an age of 6½ months, marked spasticity of arms and legs was noticed. Child lay in a position of slight opisthotonus. At an age of one and one-half years, she was admitted to the Wrentham State School. There was marked spasticity of both arms and legs with tendency to lie with feet crossed. Marked rigidity of the legs which resisted passive motion. The shape of the head was round; forehead low. Circumference of head 14¾ inches, length 11.7 cm.; width 11.3 cm. The fontanels were closed. Nystagmus of both eyes, pupils were small and reacted sluggishly to light.

After admission, several epileptic seizures were observed; petit-mal seizures occurred almost every day. She died at an age of two years, two months.

From the autopsy findings, a few data are noteworthy. The child with a body length of only 25.12 inches was extremely small for its age. The face and body appeared well proportioned. There was much difficulty in removing the brain because the dura was firmly adherent to the calvarium. The calvarium was rather thick, averaging over 6 mm. The brain was round in shape and extremely small. It weighed 250 grams including the cerebellum which weighed 60 grams. The convolutions appeared small and irregular.

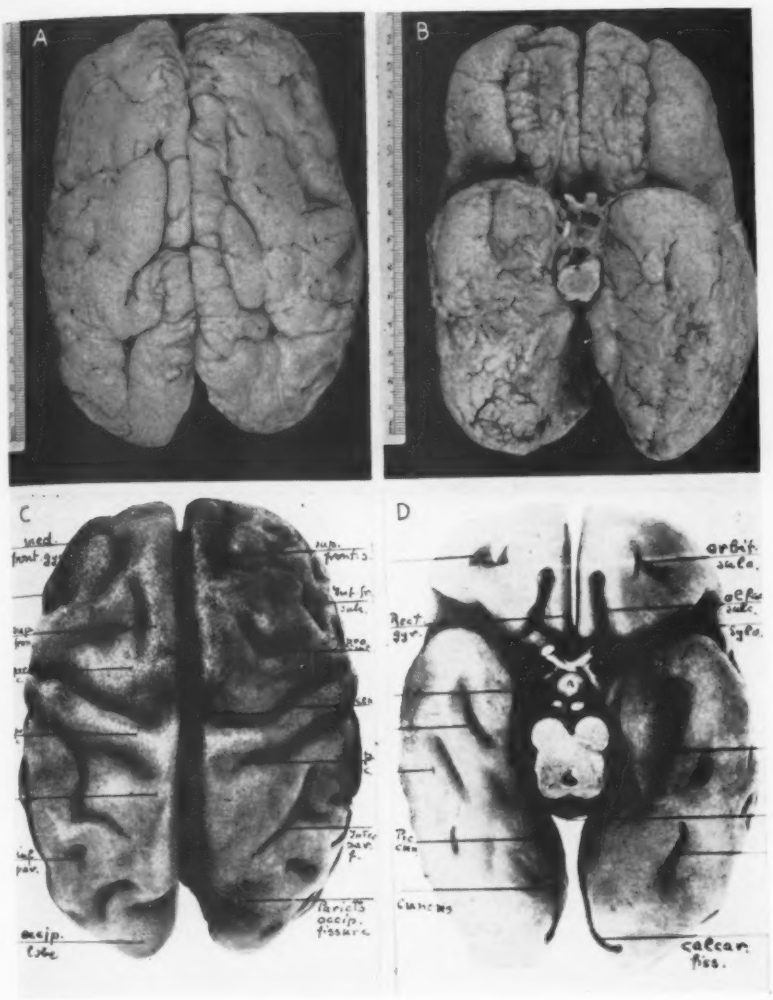
The whole convexity was covered with a grayish-white pia-arachnoid with much turbid fluid in the sub-arachnoidal space. There were some bluish discolorations upon the convexity with depression of brain tissue. There was also remarkable thickening of the leptomeninges of the spinal cord with bluish-gray discoloration.

On a horizontal section through the whole brain, the large size of the lateral ventricles was most conspicuous. The convolutions were small but well developed. The centrum semiovale showed many smaller and larger holes distributed rather symmetrically on both sides lateral to the ventricular walls and separated from them by the lentiform nucleus, and at higher levels by the corpus callosum radiation. A few small holes were found in the basal ganglia and thalamus.

Under the microscope, the small cavities revealed a peculiar picture. Few of these cavities were real holes, most of them were filled with a fine meshwork of fibers. The glia cells were regularly distributed in a circle around those holes and formed symmetrical patterns. Where the holes were large, the fiber meshwork had disappeared and a cavity filled with fluid was present. In myelin-stain preparations, the corpus callosum radiation was well developed and the optic radiation easily recognizable penetrating toward the occipital pole. The convolutions contained myelinated cores. The patches of softening with necrosis and cavity formation were most marked in the lateral parts of the white matter. The cortex showed a fairly normal architectonic with differentiation of the architectonic fields and normal fissuration. A large number of the nerve cells were, however, found destroyed, and streaks devoid of nerve cells ran radially through the gray matter. Many of the remaining nerve cells were in a stage of disintegration and all types of ischemic changes, atrophy, swelling and replacement of protoplasm toward the periphery were observed.

Discussion.

Probably the first person to call attention to the peculiar coincidence of macrogyria and microgyria interna was Obersteiner [3] in 1902. Later, Heinrich Vogt [4] discussed this subject in a critical monograph on microcephaly. I mentioned in the introduction that Southard and Raeder [2] described a case which is very similar to my first case in many respects. Their patient died at an age of 14 years. At an age of 12 years, he was only 3 feet 10 inches tall; he had paralysis of the legs, and the circumference of the head was 18 inches. At autopsy, the brain weighed 950 grams. The fissuration of the brain was more developed than in my case upon the inferior surface of the occipital and temporal lobes. The macrogyria was most marked upon the convexity of the frontal lobes. The width of the cortex measured from 6-13 mm. beneath



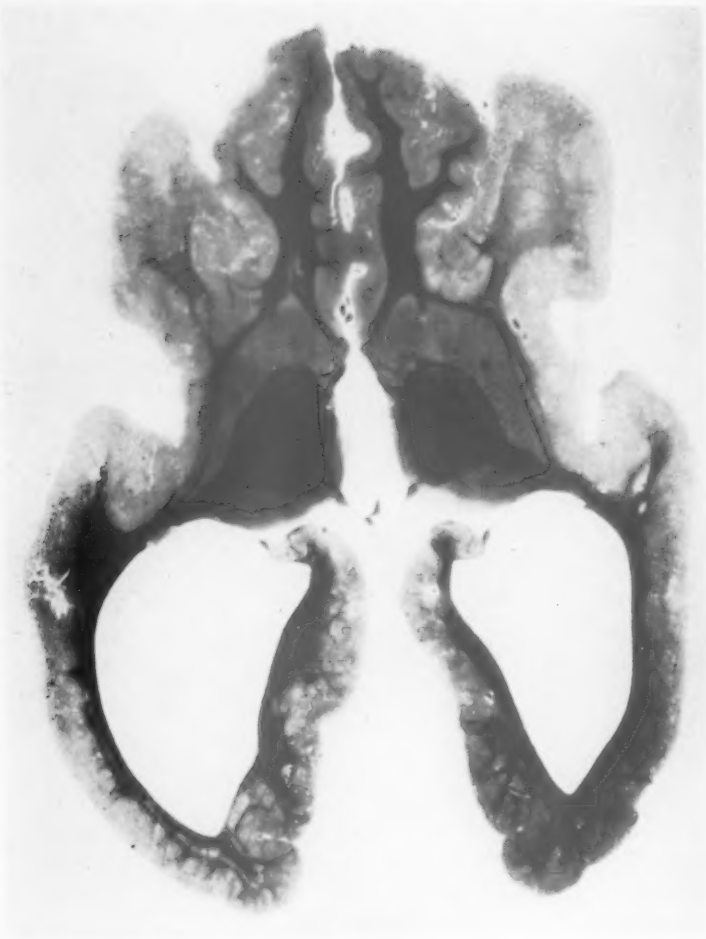
CASE 1.

A: Convexity of brain. Note the abnormal fissuration near the sagittal sulcus and absence of sulcation about the frontal and occipital lobes. The sulcus rolandi is incomplete.

B: Inferior surface of brain. Note complete absence of fissuration of the temporal lobes and absence of fissuration of the inferior frontal gyrus. Note the ruffling of the surface. (Status varurosus Retzii.)

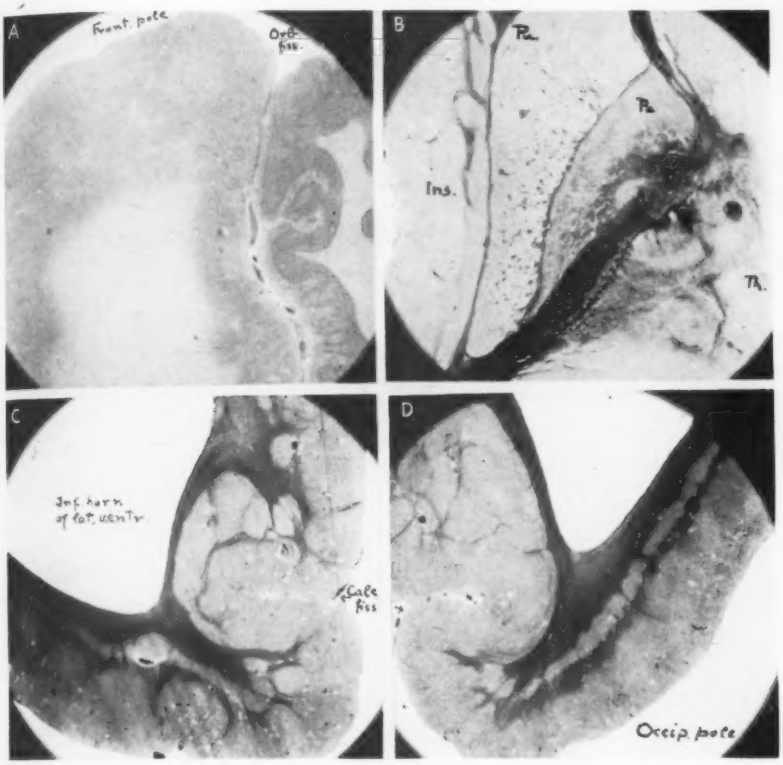
C: Brain of a normal fetus at the end of the seventh month for comparison. At seven months the fissuration is far advanced; secondary fissures are still missing. J. Kollmann Hand Atlas Entwicklungsgeschichte. (Fig. 620.)

D: Inferior surface of fetal brain of the same age as C. Note the little development of sulcation upon the inferior surface of the brain. (Kollmann, Fig. 622.)



CASE 1.

Horizontal section through whole brain. Myelin preparation. Note the normal development of basal ganglia and the advanced development of medial parts of frontal lobes. The flanks of frontal lobes and the parietal and occipital lobes are undifferentiated.



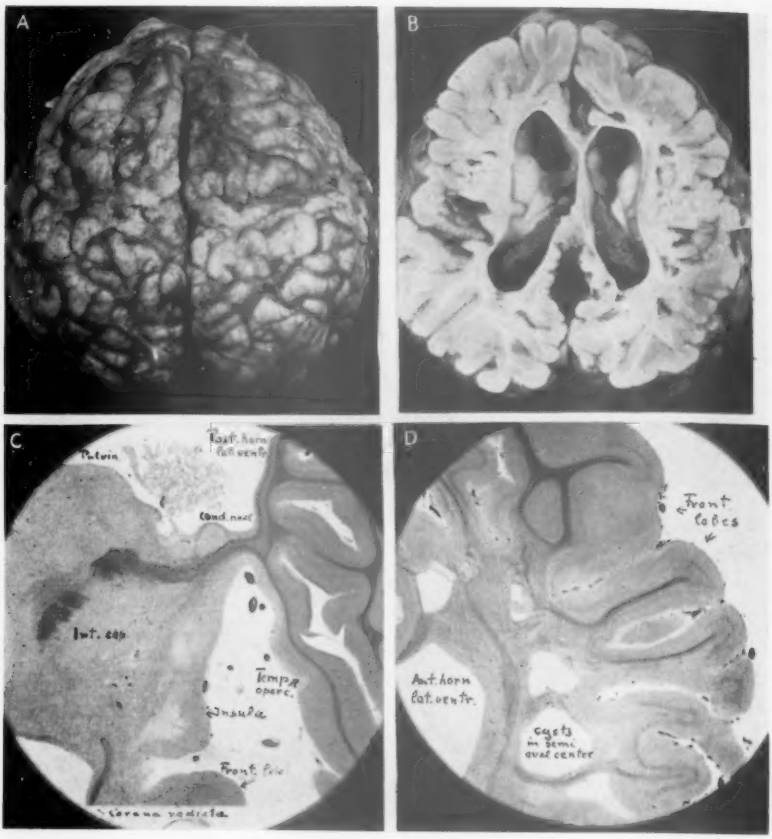
CASE 1.

A: Horizontal section through left frontal lobe including the unusually deep orbital fissure. Nissl preparation. Note the broad gray matter without lamination in the lateral part of the frontal lobe and total absence of fissuration. Ruffling of surface. The medial wall of the orbital fissure shows microgyria interna.

B: Myelin preparation of basal ganglia. The lenticular nucleus and thalamus appear normally developed. Insula is undifferentiated. (pa=pallidum pu=putamen ins=insula th=thalamus.)

C: Left occipital pole. Myelin preparation. The calcarine fissure recognizable. The gray matter is broad and undifferentiated. Optic radiation present.

D: Right occipital pole. Same structure as left. Complete agyria about the convexity.



CASE 2.

A: Convexity of brain. Note depression of central gyri and of superior frontal gyrus on both sides, especially marked on the right. Thickening of leptomeninges due to subarachnoidal hemorrhages at birth.

B: Horizontal section through whole brain. Note enlargement of ventricles. The white matter shows cystic degeneration on both sides especially marked on the right side at this level.

C: Basal ganglia and insula. Note the cystic degeneration of white matter beneath insular cortex.

D: Wall of lateral ventricle and part of frontal lobe. Myelin preparation. Note the cystic degeneration of the white matter without communication with the ventricles.

the macrogyric areas and from 2½-4½ mm. in those regions which were more differentiated. Southard and Raeder noticed the close relationship between poor furrowing outside and indistinct layering inside. They expressed the opinion that, "the small number of convolutions seems to be compensated for in a way by the extreme thickness of the cortical layer." I do not hold this view. In observing brains of this type one is struck by their resemblance to the embryonic brain at an age when fissuration begins and it seems to me that the only source of explanation comes from embryologic studies.[5, 6] During fetal development, the first appearance of sulci is noticed at the end of the fifth fetal month, at which time, the lateral cerebral fissure is well recognizable, though the insula is fully exposed. At that age, the beginning of the sulcus centralis, the sulcus frontalis and the sulcus temporalis superior is noticeable. Fissuration is more advanced at an age of seven months. (Plate 18, C and D.) The temporal lobe, however, shows only the superior temporal fissure and upon the inferior surface of the brain fissuration is still at the very beginning. The brain of my case corresponds in fissuration to an embryonic brain of about six months of age. There is, however, one difference worth mentioning: the fissuration upon the mesial surface of the brain and upon the gyrus rectus has reached a higher degree of differentiation, corresponding to a stage of embryonic development of about eight months. It is of great interest to note that the growth of the brain was not arrested in all regions at the same time. (Plate 18, Fig. A and B.)

In spite of the fact that there is so much resemblance between the simple brain pattern of the "loaf of bread" brain and the fetal brain of an age of about six months, absence of fissuration could as well be produced by sclerotic changes in the cortex as by developmental arrest. Decisive for the diagnosis of a developmental arrest is the internal structure of the cortical stratum. At the end of the third fetal month, the wall covering the ventricles presents the following layers: The lumen of the ventricle is lined by a broad layer of ependymal cells which differentiate near the outer border of this layer into neuroblasts and spongioblasts. The fetal pyramidal cells migrate toward the outer surface through the broad meshwork of spongioblasts which form the intermediate zone. At the same time, fibers which originate in the thalamus

and corpus striatum invade the intermediate zone. Outside this zone, the cortical layer is formed, and consists of a broad field of undifferentiated nerve cells, piled up into germinal centers. At the end of the fourth month, most of the cortical neuroblasts have completed their wandering and have reached the cortical stratum which is still much broader than in the later stages of development. The decrease of the size of the ventricles is mainly due to an increase of fibers in the intermediate zone which eventually becomes the white matter. It is important to keep in mind that the white matter contains fibers from two different sources which develop entirely independently of each other. The ectogenous fibers penetrate from the thalamus and corpus striatum into the intermediate zone and form the optic radiation in the occipital lobes. These fibers as well as the corpus callosum radiation develop independently from the cortical layers. It is not surprising, therefore, that in many cases of microcephaly, the capsula interna and the ectogenous fibers are well developed, even where the cells of the gray matter are undeveloped. The second source of fibers of the white matter is the axons of neuroblasts, the autochthonous fibers. These fibers occupy mostly the lateral part of the centrum semiovale. They are partly absent in the first brain which I presented, in which the spongioblastic framework is found in its primitive condition. This brain in its architectonic development reflects exactly the appearance of a brain at about the end of the fifth embryonic month, the only difference being that the ependymal line around the lateral ventricle is partly degenerated. Only in the frontal lobes near the midline has development progressed further and the differentiation of gray and white matter approaches the normal. (Plate 20, A, B, C, D.)

With regard to development of secondary fissures, there are two views which are expressed, respectively by Bielchowsky [7] and Schaffer.[8] The latter believes that the primary process in the formation of sulci is an invagination of the outside due to the formation of a proliferative wedge of the marginal veil. Bielchowsky emphasized that the development proceeds from the inside outward and that the lamination of the cortical layer precedes the formation of sulci. My observations on micro- and macrogyric brains in microcephaly and mongolism support his view that the loop formation of the gray matter precedes the formation of fis-

sures. (Plate 20, A, right side.) It seems to me that the densely piled nerve cells in the cortical stratum, after having reached a position near the surface, have a strong tangential thrust which tends to increase the cortical surface. Since the space is limited, the gray matter is folded into loops. In this way, the cortex increases in size without using more space in the skull cavity. In a later stage, the loops of the gray matter are separated from each other by secondary sulci. This process does not occur before the gray matter has reached a high degree of differentiation. Macrogyria with microgyria interna represents a developmental arrest at a time before secondary sulcation has developed. The tendency to fissuration is not recognizable before the cortical layer has approached its definitive size and lamination has appeared.

In my case, as well as that of Southard and Raeder, no tendency to fissuration was recognizable in those parts of the brain in which the cortex measured almost 10 mm. in thickness. (Plate 20, A, C, D.) The large width of the cortex is apparently not a compensatory increase in gray matter but a remainder of an early stage of fetal development.

It appears somewhat strange that this type of microcephaly is associated with hydrocephaly giving rise to a "micro-hydrencephaly." As result of the discussion on the genesis of this malformation, it may be more easily understood that the hydrocephaly is not due to enlargement of the ventricles but is due to a failure of decrease in the size of the primitive brain vesicles. This failure is due to a lack of development of the white matter, for there is an almost complete absence of developing axon-fibers and of myelination. One may therefore ask if the use of the term hydrocephaly is correct. The term "vesiculocephaly" would be more adequate and prevent confusion with the condition of true hydrocephaly in which the ventricles are enlarged by increased spinal fluid pressure.

The second case represented an arrest of growth at a later stage but the result in both cases was the same, that is, complete idiocy, with a mental age of about one month. In the second case, differentiation was fair with development of primary and secondary sulci. Microgyria resulted from arrest of further growth, which arrest was also indicated by the small brain weight of 250 grams. The large size of the ventricles can here also be explained by a

failure of development of the white matter. Most interesting is the structure of the white substance. The ectogenous fibers which originate in the corpus callosum, in the thalamus and striate body were well developed. Those fibers which take their course in a centripetal direction failed to develop and those parts of white matter which contain normally these centripetal fibers were subject to necrosis and cystic degeneration. In discussing the first case, I mentioned that the intermediate zone is formed by a spongioblastic meshwork in which fibers penetrate in centrifugal and centripetal direction. In my second case, parts of the spongioblastic meshwork remained like an empty net. It seems that these spaces are prone to necrosis and cyst-formation. In the course of increased pressure, these spaces become filled with fluid, enlarge, and the fine spongioblastic meshwork becomes torn and degenerated. This cystic degeneration had not yet progressed very far.

In the first case presented, there were no indications whatsoever of the etiological factors which produced the early arrest of development. The clinical assumption of a birth injury is not supported by the pathologic findings. The arrest of growth must have occurred several months before birth. It seems impossible that a birth injury could produce this type of brain patterns after the brain had reached a higher stage of differentiation. There was no evidence of syphilis or of other infectious diseases and no traumatic incidence during pregnancy was recorded.

In the second case, there is a definite history of severe asphyxiation at birth. It is therefore of interest to raise the question as to how much of the pathology in this case is due to that incidence. As far as the development of the brain is concerned, it corresponded to a normal full-term brain in its convolutional and fissural patterns and in the development of the cortical areas and the fiber myelination. There were no indications of developmental agenesis. A brain weight of 250 grams is small for a full-term baby but may be considered as low normal and it is not known how much loss of weight was due to brain degeneration.

The chief pathologic feature of this case was the extensive cystic degeneration of the white matter. It is known that the white matter is especially vulnerable to prolonged asphyxia. The slight degeneration found in the nuclei of the basal ganglia and thalamus can also be explained by severe asphyxia. It is interesting to note

that the degeneration is most extensive in those areas which contain fiber bundles which myelinate after birth. Those fibers which are normally myelinated at the time of birth are much less affected. I have made the same observation in another case of cystic degeneration. If it could be shown that the cystic degeneration, sometimes wrongly referred to as porencephaly, a condition found only in infancy, depends on the presence of unmyelinated fibers, this would suggest an abnormal sensitivity or lowered resistance of the immature fibers to adverse conditions such as asphyxia. This seems to me well worth investigation.

SUMMARY.

Two cases have been presented which illustrate two types of pathology which may be encountered in low grade idiocy with microcephaly. The first case represents a developmental arrest with macrogyria and microgyria interna. In its degree of development, this brain corresponded to the brain of a six months fetus.

The second case is one of microcephaly with cystic degeneration of the white matter. History and pathology indicate that the cystic degeneration was due to prolonged asphyxia at birth.

Both cases showed micro-hydrocephaly and the difference between this condition and true hydrocephaly has been discussed.

BIBLIOGRAPHY.

1. McClelland, Joseph E.: J. Pediat., 16: 36-51, 1940.
2. Southard, E. E., and Raeder, O. J.: Waverley researches in the pathology of the feeble-minded. Memoirs Am. Acad. Arts and Sci., 14: 3, Dec. 1921.
3. Obersteiner, H.: Arbeiten Neurol. Inst. Vienna, 8: 1-66, 1902.
4. Vogt, Heinrich: von Monakaw. Arbeiten Inst. Zurich, 1: Wiesbaden, 1905.
5. Keibel, F., and Mall, F. P.: Manual of human embryology, J. B. Lippincott, 2: 1912.
6. Kollmann, Julius: Handatlas der Entwicklungsgeschichte des Menschen. Jena, 1907.
7. Bielchowsky, Max: J. Psychol. Neurol. Leipzig, 30: 29, 1923.
8. Schaffer, K.: Z. ges. Neurol. Psychiat., 38: 1, 1918, and *ibid.*, 38: 79.

DISCUSSION.

DR. OSCAR J. RAEDER (Boston, Mass.).—I want to congratulate Dr. Benda on the good fortune of finding one of these rare specimens which mean so much to us in trying to find out how the normal brain grows and develops.

There have been only a very few of these specimens in which the fissuration is so markedly abnormal, as in this case that Dr. Benda shows.

Bielchowsky in Berlin described such a case, and when I was in Berlin I discussed that case with him and also the case that I had. He knew about our Waverley case, and he agreed that our case showed less fissuration than his. The case that Dr. Benda shows today exhibits still less fissuration than the Waverley case.

Bielchowsky, who has perhaps given the greatest amount of study and thought to this subject, although Martel and Schaffer and others have done a great deal too, divides the ventricle wall into four layers. He speaks first of the ependymal layer and second of a narrow white layer—I say white, because it is white matter, although in the slide shown by Dr. Benda it is stained black. Thirdly there is a thick layer of undifferentiated cells which later develop into ganglion cells. Bielchowsky calls this the middle zone. Finally there is at the very outside a small layer of cortex.

Now, according to Bielchowsky's theory, as the brain develops, the undifferentiated cells in the middle zone develop fibers; in the brain of Bielchowsky's and in that which Southard and I examined these fibers were partly undeveloped. It seems that the proliferation of these fibers pushes these ganglion cells out and into the cortex, while these white fibers form a large part of the white matter. This pushing out causes the cortex to expand and double up into convolutions to find room for itself.

In this case, because these cells did not differentiate, did not form fibers and did not push the cells out but remained undeveloped, they left the vacuum which is partly filled up with fluid; and no reduplication was needed and consequently no convolutions were formed. Southard and I found some pathological cells such as rod cells which made us feel that some disease process had inhibited development for a while, but that this force had spent itself and some further development followed as seemed to be shown by a double layer of large Betz cells in our specimen.

I agree with Dr. Benda that according to our studies of the Waverley case and an examination of his findings the Bielchowsky theory seems to explain the facts more satisfactorily in both our cases.

PSYCHOBIOLOGICAL STUDIES FOLLOWING SECTION OF THE CORPUS CALLOSUM.

A Preliminary Report.*

By ANDREW J. E. AKELAITIS, M. D., Rochester, N. Y.

Introduction.

The corpus callosum has provided, for more than two centuries, opportunities for numerous theories as to its function.

Most investigators, according to Mingazzini,[1] are agreed that following lesions of this great commissural system mental symptoms predominate. Collier,[2] I believe, expresses the current view rather well when he remarks: "Of all lesions producing mental reduction, those of the corpus callosum have been the most striking and constant, and especially when the splenium is destroyed."

Dr. William P. Van Wagenen, neurosurgeon at the Strong Memorial Hospital, has sectioned the corpus callosum partially or completely in ten patients with epilepsy. The physiological basis for this surgical approach is that surgical division of the association pathways may limit the spread of an epileptic discharge to one hemisphere.[3]

The present paper is concerned with the psychobiological study of these patients before and after operation. In each patient a careful psychiatric history, including a personality study, was obtained from relatives and patient. A complete psychiatric status was performed before and after operation. Detailed psychological tests have been made by Dr. Frances H. Parsons.[4] The patients were on a surgical or pediatric division throughout their stay. As a rule, the patients were seen daily in order to obtain as good rapport as possible. Many of these daily visits were intended to be informal and friendly. All information that could be obtained

*Read at the ninety-sixth annual meeting of The American Psychiatric Association, Cincinnati, Ohio, May 20-24, 1940.

From the Department of Medicine, University of Rochester School of Medicine and Dentistry, and the clinics of the Strong Memorial and Rochester Municipal Hospitals, Rochester, N. Y.

from the house staff, nurses, fellow patients and relatives was utilized. After discharge from the hospital these patients have been followed at regular intervals and their status up to October 1, 1939, is described.

CASE REPORTS.

CASE 1.—G. M. R., white, bachelor, aged 34, with right cerebral birth palsy and grand mal seizures for the past ten years. Affable, sociable, cheerful, intelligent, with two years of college. In charge of welfare project in small Kentucky town. *Body and posterior half of genu of corpus callosum divided* February 11, 1939. No psychobiological changes noted after operation. Loss of apprehension on basis of suggestion probable.

CASE 2.—W. S., white, phlegmatic, single farm-hand, aged 26, with grand mal seizures following a head trauma ten years ago. Emotionally undemonstrative, sociable, naive, with expressionless facies and a tendency to swear genially. Binet level 13 years, 7 months. *Body and posterior half of genu of corpus callosum divided in two operations,* February 22 and 27, 1939. Left hemiparesis developed as a result of a retrograde thrombosis in one of the ligated veins. Psychobiological changes consisted of accentuation of fixed facial expression, diminution in spontaneity, mild apathy and monotonous speech but no disturbances in sensorium, mental capacity or intellect. Binet level 13 years, 5 months. On May 4, 1939 *corpus callosum divided from rostrum to a point one centimeter anterior to tip of splenium* and *left fornix cut.* Psychobiologically, no changes were observed at variance to those found before first operation except for loss of rhythm in music and inability to play a guitar because of clumsiness in left hand. Finally committed to epileptic colony.

CASE 3.—F. R., white, spinster, aged 26, with a left Erb's birth palsy and grand mal seizures for twenty-four years. Shy, sensitive, kindly, of normal intelligence, fond of music and cross-word puzzles. She was a successfully treated congenital luetic with negative blood and spinal fluid findings. Binet level 18 years, 3 months. *Body and posterior half of genu of corpus callosum sectioned* February 23, 1939. Left hemiparesis with hyperesthesias and dysesthesias developed post-operatively. Psychobiological changes consisted of psychomotor retardation, dysarthria, depression, apprehension, a transient period of suspiciousness with ideas of reference, and mild disturbances in sensorium consisting of talking of herself in the third person for the first fourteen days post-operatively. Binet level 16 years, 5 months. While home, patient and family observed a peculiar form of dyspraxia lasting for about three weeks in which she would find herself trying to open a door with her right hand, and at the same time pushing it shut with her left hand; putting her dress on with the right hand and pulling it off with her left hand; wanting to walk forward but remaining motionless because there was an equal urge to go backwards. On May 25, 1939 *remainder of corpus collosum*

and left fornix divided. Left hemiparesis remained. Psychobiological changes continue as psychomotor retardation, depression, phobias regarding contamination, difficulty with memory for recent events and a disturbance in her ability to play the piano. No return of the diagonistic dyspraxia. Binet level 17 years, 4½ months. Subject to "catastrophe" reactions.

CASE 4.—R. M., white, mentally retarded boy, aged 10½ years, with right-sided Erb's birth palsy and left hemiplegia, has had grand mal seizures for nine years and status epilepticus on several occasions. A shy, agreeable, reticent youngster at home but asocial, combative and a behavior problem in school. For the past two years he has been in an epileptic colony. Stanford-Binet level of 7½ years. *Body of corpus callosum sectioned* March 4, 1939. No psychobiological changes noted, Stanford-Binet level of 7 years, 4 months.

CASE 5.—E. J. B., white, deteriorated, spinster, aged 24, with grand mal seizures for fourteen years and psychomotor attacks for the past six years. Marked personality changes during the past six years consisting of temper tantrums with combativeness, resentfulness, selfishness and irritability. Dull, slow, circumstantial talking, apathetic, memory impaired, Binet level 11 years. *Body and posterior half of genu of corpus callosum sectioned* March 18, 1939. No psychobiological changes observed. Binet level 10 years, 4 months. *Remainder of corpus callosum sectioned* April 24, 1939. No changes noted. Binet level 10 years, 4 months.

CASE 6.—H. K., white, high school girl, aged 16, possibly ambidextrous, with onset of grand mal seizures at the age of 3 years, but of increasing frequency for past two years. An attractive, sociable, popular girl who is a leader in school and social affairs. Interested in music and literature. Essentially normal mental status, Binet level 16 years, 9 months. *Body and posterior half of genu of corpus callosum sectioned* March 29, 1939. No psychobiological changes, Binet level 16 years, 1 month. Musical ability (playing piano and French horn) not disturbed. Died during second operation July 6, 1939.

CASE 7.—C. N., white, single woman, former school teacher, aged 36, with grand mal and petit mal seizures for ten years and several psychomotor attacks. Sensitive, suspicious, reticent, apprehensive, emotionally unstable individual with idealistic philosophical and abstract religious preoccupations. She has received two college degrees and stopped teaching in 1936 because of increasing frequency of attacks. Frequently expresses concern over her declining mental ability. Mental status revealed apprehensiveness, easy tearfulness, some irritability and psychomotor retardation. Binet level 17 years, 9 months. Physical examination showed a saccular type of bronchiectasis in the left lung. *Body and greater part of the genu of corpus callosum divided* April 4, 1939. No psychobiological changes observed. Binet level remains the same as before operation.

CASE 8.—E. B., white, single woman, former secretary, aged 43, with grand mal, petit mal, and stereotyped "hysterical" attacks for the past six

years, the first attack following shortly after a disappointment in love. Received A.B. degree in 1923 and worked as secretary until 1937. In 1937 resection of the anterior two-thirds of the right temporal lobe because of an astrocytoma. She has always been a tense, reticent, shy, sensitive individual interested in reading, music, flowers and cross-word puzzles. In past two years she has assumed an invalid rôle. Mental status revealed a reserved, intelligent, cooperative, but mildly apathetic woman; Binet level 18 years. *Genu and body of corpus callosum sectioned* April 21, 1939. No psychobiological changes observed following operation. Binet level 17 years, 4 months.

CASE 9.—A. M., white, single, former gardener and mill-hand, aged 25, with grand mal seizures following a head injury ten years ago. Affable, good-natured, naive, boyish, and of normal intelligence. Mental status revealed essentially normal findings except for a tendency to exaggerate his faults. Binet level 16 years. Fingers of right hand amputated 1 year ago. Pupils irregular and react poorly to light. *Corpus callosum sectioned from anterior commissure to a point about one centimeter anterior to tip of splenium and left fornix divided,* May 13, 1939.

For two weeks post-operative, undetermined pyrexia (up to 104 degrees Fahrenheit) prevailed. During this period, patient was delirious especially at night. Subsequently no psychobiological changes were found. Binet level remained the same.

CASE 10.—G. B., white, mentally retarded boy, aged 14, with left-sided hemiplegia following diphtheria at the age of 2 years. Grand mal and "dizzy" attacks following pertussis 6 years ago. Left school at thirteen while in the fourth grade. He is a friendly, good-natured, cheerful, and cooperative youngster frequently commenting on his "dumbness." Binet level 9 years, 3 months. *Corpus callosum completely sectioned and left fornix divided* May 19, 1939. No psychobiological changes observed after operation. Binet level 10 years, 1 month.

DISCUSSION.

General Behavior.—In 8 patients no changes were observed.

In 2 patients (cases 2 and 3) the changes consisted essentially of psychomotor retardation with diminution of spontaneity and a monotonous voice. In case 3 there was a short period of childish behavior and a diminution in responsiveness to questioning previously described by Alpers.[5] It must be emphasized, however, that in case 2, objective evidence of a thrombosis of a cortical vein over the right frontal lobe was found to account for the post-operative hemiparesis and paresthesia on the left side. As the neurological picture receded the psychobiological changes cleared. In case 3 the left-sided hemiparesis and dysarthria, post-opera-

tively was interpreted by this shy, introspective woman as a realization of her fears that eventually she would develop paresis. This, I believe, was an important factor in precipitating the depression and subsequent panic state with paranoid ideas. She has continued to be depressed and has to make a real effort to do anything spontaneously. The transitory state of di-agonistic dyspraxia following the first operation reminds one of the occasional difficulty seen in catatonic schizophrenics. One could only theorize as to the mechanism of this phenomenon in this patient.

Mood.—No changes were observed in 8 patients. In 2 individuals (cases 2 and 3) variable changes were present. In case 2 the apathy and perplexity were most marked when the hemiparesis was most evident and subsequently disappeared. This would suggest that these changes were most likely due to cerebral damage. In case 3 cortical injury and psychobiological factors played, I believe, the predominant rôle.

Distortions of content was absent in 8 cases. In case 3 the paranoid picture is best explained on psychobiological factors as described above. In case 9 the transient mild delirium was associated with an undetermined post-operative pyrexia.

Orientation was disturbed in 2 patients. In case 3 the patient was occasionally disoriented for 2 weeks following the first operation when she was uncomfortable physically. For one week post-operatively she occasionally spoke of herself in the third person. In case 9 disorientation was present during the pyrexial stage.

Remote memory was not disturbed in any of the patients.

Recent memory was definitely impaired in one patient (case 3).

Retention.—As a general rule, most patients showed a fall of one digit post-operatively; this, I believe, has little significance.

Calculation and general information were not disturbed.

Judgment.—With the exception of one patient (case 3), no disturbances could be found as obtained from personal interviews, observation of behavior in the hospital by staff members or after discharge at home by relatives and friends. It is of course rather difficult to comment on their judgment in complicated life situations since none of them have even made the step towards going back to their former occupations. However, I have been impressed by their ability to discuss their plans for the future and to decide as to the advisability of undergoing another operation in those

patients operated on subsequently. In case 3 I feel that her affect determined her judgment considerably, she was subject to develop the catastrophe reaction described by Goldstein [6] rather readily when she felt she was doing poorly in formal tests.

Insight.—Of those patients (cases 2 and 3) who showed psychobiological changes, case 2 never gave any indication that he was cognizant of it, commenting only on the clumsiness and numbness in his left arm; case 3, however, was probably too concerned.

Psychometric Tests.—Although admittedly inadequate to study the actual performance of the individual, with limitations, the Binet level gives us a sort of quantitative indication of intelligence factors. In only one patient, case 3, a significant fall was observed following operation.

Briefly stated only 2 cases showed psychobiological changes and in one (case 2) objective evidence of post-operative pathology in the right cerebrum was found. In case 3, neurogenic and psychobiological factors played a marked rôle in the determination of the personality change.

In two patients (cases 5 and 7) partial and complete section of the corpus callosum had no effect upon the nature of the psychomotor attacks.

TABLE I.

CONCLUSIONS.

In a study of seven patients with partial and in three with complete section of the corpus callosum, psychobiological changes were noted in only two. In both of these evidence of involvement of the right cerebrum was present.

Consequently it appears that surgical section of the corpus callosum in epileptics does not result in the marked psychological changes noted by those investigators who have based their studies upon degenerative, vascular and neoplastic lesions in and about the corpus callosum.

BIBLIOGRAPHY.

1. Mingazzini, G.: Der Balken. Julius Springer, Berlin, 1922.
2. Collier, J.: Localization of function in the nervous system. Brit. Med. J., 1: 55, 1930.
3. VanWagenen, W. P., and Herren, R. Y.: The surgical division of association pathways in the corpus callosum and its relation to the spread of an epileptic attack. Arch. Neur. and Psychiat., 44: 740-759, 1940.

TABLE I.

Case No.	Age.	Sex.	Lat.	Pre-op. neurol. state.	Psychiatric status, post-operative.			Remarks.	Operation.
					General behavior.	Mood and content.	Sensorium.		
1 G. M. R.	34	M	RE LH LF	Right hemiplegia	No change.....	Loss of apprehension.	No change.....	.....	2/11/39 body and posterior half of genu sectioned.
2 W. S.	26	M	RE RH RF	Normal.	Loss of spontaneity: monotonous speech.	Perplexity and apathy.	No change.....	Left sided hemiparesis with paresthesia.	2/22/39 body sectioned. 2/27/39 posterior half of genu sectioned.
					Return to preoperative state.	No change from pre-operative state.	No change.....	Unable to play guitar. Loss of musical rhythm.	5/4/39 C. C. sectioned from rostrum to point 1 cm. anterior to tip of splenium. Left fornix divided.
3 F. R.	26	F	LE RH RF	Left Erb's palsy	Childish; loss of spontaneity; dysarthria.	Depressed; paranoid.	Recent memory impaired.	Left sided hemiparesis with paresthesia.	2/23/39 Body and posterior half of genu sectioned.
					Psychomotor retardation.	Depressed; phobias regarding contamination.	Recent memory impaired. Subject to "catastrophe" reaction.	Difficulty with piano playing. Temporary state of "di-agonistic dyspraxia."	5/29/39 C. C. sectioned completely. Left fornix divided.
4 R. M.	10	M	RE RH RF	Left hemiplegia	No change.....	No change.....	No change.....	.....	3/4/39 body sectioned.
5 E. J. B.	24	F	RE RH RF	Normal	No change.....	No change.....	No change.....	.....	3/18/39 body and posterior half of genu sectioned.
					No change.....	No change.....	No change.....	.....	4/24/39 C. C. sectioned completely.

TABLE I.—CONTINUED.

Case No.	Age.	Sex.	Lat.	Pre-op. neurol. state.	Psychiatric status, post-operative			Remarks.	Operation.
					General behavior.	Mood and content.	Sensorium.		
6 H. K.	16	F	RE R/LH RF	Normal	No change.....	No change.....	No change.....	Patient died at second operation.	3/29/39 body and posterior half of genu sectioned.
7 C. N.	36	F	RE RH RF	Normal	No change.....	No change.....	No change.....	.....	4/4/39 body and greater part of genu sectioned.
8 E. B.	43	F	RE RH RF	Normal	No change.....	No change.....	No change.....	.....	4/21/39 body and genu sectioned.
9 A. M.	25	M	RE L/RH RF	Fingers RH amput.	No change.....	No change.....	No change.....	.....	5/13/39 C. C. sectioned from rostrum to a point 1 cm. anterior to tip of splenium. Left fornix divided.
10 G. B.	14	M	RE RH RF	Left hemiplegia	No change.....	No change.....	No change.....	.....	5/19/39 C. C. completely sectioned. Left fornix divided.

LEGEND.

Lat.—Laterality.
RE—Right ocular dominance.
LE—Left ocular dominance.
RH—Right-handedness.
LH—Left-handedness.
RF—Right-footedness.
LF—Left-footedness.

4. Parsons, F. H.: A study of eight cases of section of corpus callosum in individuals with history of epileptic seizures. (To be published.)
5. Alpers, B. J.: The mental syndrome of tumors of the corpus callosum. Arch. Neur. and Psychiat., 35: 911-913, 1936.
6. Goldstein, K.: The organism. Amer. Book Co., N. Y., 1939.

DISCUSSION.

SPAFFORD ACKERLY (Louisville, Ky.).—I have had only one case that I picked up quite accidently, of agenesis of the corpus callosum: a 19-year-old boy who presented a picture not unlike certain particulars that I found in a case of agenesis of the prefrontal lobe, and I suspected that the encephalogram might show something there; it didn't. Our X-ray man picked up a case of agenesis of the corpus callosum. He showed a mild but unmistakable euphoria. He believed he could do the impossible. He had dull normal intelligence. He had gotten almost up to the first year in high school but he was unable to look around the corner, so to speak; judgment was impaired in little things, although he was earnest and sincere in wanting to make an adjustment and so contrite whenever he had done anything that he shouldn't have done. How he kept out of the hands of the police I don't know, but he didn't do anything vicious; he was only stealing from home and from one neighbor. But I really couldn't tell, clinically, the difference between this case and that of the frontal lobe lesions. I'd like to ask if electro-encephalography was done before and after operation on these cases.

THEODORE A. WATTERS (New Orleans, La.).—If one studies the literature on disorders of the corpus callosum, he is struck with a lack of consistency and unanimity of opinion. Most observations have been made on tumor cases, agenesis, vascular affairs, and on experimental animals. However, the findings from tumor cases are hard to evaluate because of adjacent structures being involved and because of the principle of diachisis, which of course is that involving distant function. In agenesis, all cases of necessity have been studied in retrospect, which is not altogether reliable. Those cases where vascular disorders have been under consideration must be carefully evaluated on account of the multiple arterial distribution of the corpus callosum and when vascular lesions are found they are usually multiple.

Studies in experimental animals naturally have their limitations because they cannot be applied very well from a psychobiological point of view. Any number of authors have pointed out that sectioning of the corpus callosum leaves the individual with no particular disability. Cushing has had that point in view. Others are quite different in their opinion. Alpers, for example, believes that there is distinctly a deficit in the memory sphere, difficulty in thinking, inability to concentrate and an imperviousness to all stimuli, particularly those of auditory character. Raymond feels that there is a difficulty in the association of ideas, loss of memory especially for recent events, peculiar behavior, change in character and a lability of the emotions and of temperament. And there are others who feel convinced that in lesions

of the posterior part of the corpus callosum consistently there is found a Korsakoff syndrome. Here again much of the work that led to such conclusions has been carried out on tumors, and the neighboring structures, particularly the cerebral hemispheres, may very well have been involved. King and Meehan in studying Marchiafava's Disease in Italian people around 50 where there is an involvement of the corpus callosum, found that there was a distinct emotional disorder characterized by irritability, apathy, intellectual deterioration and convulsions. However, they made another statement to the effect that diagnoses of the disorder was always made at autopsy; the patient was usually around 60 years of age in that group, and further, they found evidence of bilateral demyelinization elsewhere in the brain.

I have seen one case of a lesion of the corpus callosum which occurred in a man about 45 years of age. He came into the hospital alone and was our sole informant. He gave the history of prolonged alcoholic bouts, and had been on a bout previous to his admission. His recent memory was involved; he was practically disoriented in all spheres; he showed no consistency in his statements one day as compared with another; and after complete studies had been made we hadn't reached a point where we wanted to do an encephalogram. After he had been in the hospital about 10 days he showed all sorts of bizarre psychological signs, and he became slowly but progressively psychotic. He became destructive, abusive; and he was so obstreperous that he had to be transferred to the city mental hospital. After he was admitted to the city mental hospital, one day out of a clear sky he had a generalized convulsion. The spinal puncture was negative completely, but after he had had one or two other convulsions, they proceeded to do another puncture and he died very shortly afterward. Autopsy disclosed a tumor in the splenium of the corpus callosum.

Dr. Akelaitis has given us a study under rather ideal conditions, and certainly one divested as much as possible of retrospective study. These studies were carried out on epileptics, and we know that epilepsy presents many opportunities for study aside from the corpus callosum. In view of Orton's formulation of catatonia as well as many of his other theories with regard to cerebral dominance, Dr. Akelaitis, I believe, has an excellent opportunity to put to a severe test these theories.

JULES H. MASSERMAN (Chicago, Ill.).—The persistence of bilateral epileptic attacks in the epileptic patient with the lesion of the corpus callosum would tend to confirm the work of Dr. Gerard who showed that the spread of activity from one location of the brain to another can occur irrespective of anatomic continuity. I wonder if Dr. Akelaitis would comment on that very interesting and striking phenomenon.

ANDREW J. E. AKELAITIS.—In reply to Dr. Ackerly's question as to electroencephalograms, yes, they have been taken before and after operation; not only once, but several times. I wish to say that these patients have been

studied in a very thorough manner; my study is just one part of the program. We have studied the gaits of these patients with Dr. Schwartz' basiograph, and it is amazing that no changes are found in the gait. Movies are taken, and voice records are made.

To Dr. Masserman's question regarding the bilateral epileptic manifestations, I would say that one of the very striking things about some of these patients has been that after operation they will have Jacksonian attacks on one side of the body, and then the following day they may have them on the other side. Not infrequently these attacks have spread and become bilateral. Studies with the electroencephalogram during a seizure—unfortunately we haven't gotten any during the so-called grand mal seizure postoperatively but the so-called petit mal attacks have shown not infrequently the so-called petit mal waves beginning in both sides at the same time. That is, the waves appear simultaneously on both sides of the skull after complete section of the corpus callosum.

AN OBSERVATION NURSERY.

A Study of 250 Children on the Psychiatric Division of Bellevue Hospital.*

By LAURETTA BENDER, M. D., and HELEN YARNELL, M. D.,
New York City.

This constitutes an analytical and follow-up study of 250 children from one to five years eleven months of age at the time of their first admission in an observation nursery on the psychiatric division of Bellevue Hospital from November 1934 to December 1939, inclusive.

This nursery serves the double function of arranging for state institutional care for some young defective children otherwise public charges, and for the study, training and treatment, and recommendation for subsequent placement or care of other young children whose behavior deviates from the normal. There were about an equal number of children in these two groups.

The study of each child included complete pediatric, neurological, orthopedic or other evaluations of the child's biological status, such as were indicated; it also included careful psychometric and psychiatric studies. Treatment was directed to correct any biological deviations, socializing therapy, specific psychotherapy and habit training. An effort was made to combine the necessary features of a pediatric ward with the best available features of a good nursery school. Free play and intimate interhuman relationships were emphasized rather than routine when possible.

Two-thirds of the children were boys and one-third girls; this ratio of boys and girls is typical of all of our groups and problems among children observed at Bellevue.

One-half of the children were under observation for a month or less. Those who stayed less than a month were either children who were obvious defectives in transit to a state institution or children whose mothers removed them before the period of observa-

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tion was completed. One-third remained from one to two months and one-sixth more than two months. In a few cases, children were under observation for many months. In general such a service can be had with two months of observation or less for each child, with some allowances for unusual problems. For example, there may be recurring or prolonged physical illnesses which complicate observation. The period of observation represented a total of all readmissions for each child even when the readmission occurred after the child was six years of age.

The majority of the children were referred by public agencies, and were dependent on the city. The children's courts and children's societies referred neglected children. Child-placing agencies referred totally or sometimes partially dependent children. Others were referred by the Bureau of Child Welfare (Widow's Pension) and family case working social agencies. Some of the referrals from all of these sources came through mental hygiene clinics connected with Bellevue or one of the other city hospitals. A few were referred directly from hospital contacts, private physicians or informed parents.

One-half of the children had two American-born parents. One-third had at least one foreign-born parent. Data are incomplete on the other sixth. Fifteen per cent of the children came from negro homes. This is less than would be anticipated, judging from the twenty plus percentage of negro children of all ages on the children's ward and indicates a proportionately greater neglect of the under-six negro child. One-fourth of the children came from Jewish parents. This is not because there is a disproportionate amount of deviation in the young Jewish child but because the Jewish agencies are more active in mobilizing the community facilities for their deviating children, especially the dependent ones.

An analysis of the intelligence level of the group as a whole was made on the basis of the IQ nearest the date of first admission. This showed that about one-half had an IQ of about 75 per cent and less, with a fairly even distribution through all of the defective levels from below 30 per cent to above 70 per cent; one-half were of normal intelligence of about 75 per cent or better. Eighty showed a plateau distribution from 75 per cent to 95 per cent; twenty-five had an IQ range of 95 per cent to 110 per cent, and ten were superior, ranging up to 150 per cent. Analysis

of series of IQ's on one child when they were available, as they often were, showed very little stability in the IQ of these children. In general we may say that the IQ tended to drop in the defective children and to rise in the non-defective group.

Mental defective children constitute one-half of the total, or 128; of these, about 100 were placed in institutions, only 7 died. Forty were familial; these usually came from foundling institutions or as neglected children from the courts. They were placed in state schools for defective children. There was a high percentage of psychopathology and social pathology in the families of these children, as well as familial mental deficiency. Many were illegitimate; there were some anomalies of development but these were not conspicuous. The IQ range was relatively high; only 3 were idiots, and 10 were borderlines. A series of IQ's (at least three) were available in 28 cases; of these, in about one-half the IQ tended to remain the same or rise a little, while in the other half the IQ tended to drop as the mental age tended to become stationary. Because of steadily rising IQ in one child who had been institutionalized all her life, we have some doubts as to whether state school commitment was the proper disposition, as normal children with the same institutional background show the same tendency for retardation in the early period due to isolation factors, but the IQ tends to rise especially with socialization.

Forty children had congenital anomalies. Sixteen were microcephalic, equally distributed between boys and girls. These appear to occur sporadically, without any special regard to family history. Reasons for emergency commitment (necessary through our ward) were the birth or presence of younger siblings, illness or other incompetence on the part of the mother, or excessive emotional distress on the part of the mother in reaction to the abnormal baby. Etiology was determinable only in one pair of non-identical twins who had been exposed to radiation therapy due to a spinal tumor of the mother during the first weeks of their development. The IQ range in this group was low, all but three having IQ's below 50 per cent. The question is raised as to whether we have not failed to diagnose the higher grade microcephalic deviating child and if this type does not probably constitute some of the eleven in the "undeterminable" group of defectives of our series.

In the lower levels this group includes the most instructive "experiments of nature" revealing all types of primitive levels of brain physiology and throwing considerable light on developmental patterns in the normal child. Correlative anatomical studies would be justified wherever possible.

A miscellaneous group of nine children showed gross and often multiple anomalies of the brain, skull and often other parts of the body as well. They are non-classifiable. Unlike the microcephalics, the families of these children showed a great deal of social and psychopathology but less indication of familial mental deficiency than the familial group as such. Furthermore, the attitude of the family towards the child nearly always showed excessive negative features. The IQ range was uniformly low, being below 50, with a tendency to drop as the mental age became stationary at 6 to 8 months. There was a relatively high mortality in this group.

There were nine mongolian idiots. Although the age range of mothers at the time of birth of these children did not in our series appear significantly different from the age range of the mothers of the microcephalic infants, it was significant that whereas mothers of microcephalic infants were forced to apply for state care of their microcephalic child because of the birth of a subsequent normal child, there was not one instance in which the mother of a mongolian baby had a subsequent baby during the time covered by this study. Commitment was petitioned in two-thirds of the cases because the mother was deemed incompetent to care for the child and in one-third, interestingly enough, because the child was so overactive and dangerous to the welfare of other children in the neighborhood, that persons outside of the family petitioned the court for removal of the child. The IQ range was 25 per cent to 55 per cent, the mental age tended to level off before the age of six years.

Endocrine features were observed in six children. It is felt that the endocrine features did not represent etiological factors, but one more evidence for the biological deficiency. There were two cretinoids, two with general developmental retardation of the total somatic system, sometimes ascribed to masked hypothyroidism, and two with pituitary features.

Birth injuries accounted for 23 children. Four of these were doubtful. A relatively difficult forceps delivery at full term with-

out post-natal signs is held accountable for high-grade deficiency and hyperkinesis but without neurological signs. Five others were full-term babies but the history and nature of injuries seem to leave no doubt as to birth injuries; one weighed 13 pounds and was cyanotic at birth, and had convulsions in 48 hours. One was born in convulsions, of a mother who herself had convulsions associated with eclampsia; it is fair here to raise the question as to whether the damage was traumatic or toxic. One was a post-mature induced labor, with asphyxia of the infant, convulsions and collapse of lung; the damage to the brain did not permit of any subsequent development. One was a breech presentation with turning, cyanosis and convulsions. In only one was the evidence of direct damage of forceps to one eye with a depressive fracture of the frontal bone unequivocal.

In fourteen cases the children were prematures, having a gestation period of less than 32 weeks, or birth-weight less than $5\frac{1}{2}$ pounds. Nine had a known birth-weight under 4 pounds. This then is the most important cause of birth injuries to the child. It is probable that difficulties in establishing circulation in the brain is the etiological factor. One was a Cæsarian birth. There are three types: (1) The brain damage is gross, development often remains below six months, and primitive reflexes, such as grasping, sucking, Babinskis, and Moro reactions are common. They are often physically puny as well. (2) The child may show relative retardation in development which, however, continues until $1\frac{1}{2}$ to $2\frac{1}{2}$ years, when a series of convulsions, or an accident or severe illness marks a cessation or even a regression of development. (3) Some children showed retardation in development but progressed enough at least to walk, and these children all showed marked hyperkinesis, a good deal of reflex motor play, and in the more highly developed children more or less serious asocial behavior disorders. They were physically puny. The range of IQ in this subgroup may reach all levels and the child may not be mentally defective although usually relatively lower in mental development than the family average.

The social level of the families with birth injury children was the highest in our series. They were often referred to us by private physicians and many of the children were subsequently removed from institutions when the family crises which necessi-

tated hospitalization had passed and the family felt able to care for the child.

Three cases of Little's disease were differentiated on the basis of neurological pictures which gave evidence of involvement of recognizable systems of brain tracts. The motor disturbance was usually generalized throughout the body but emphasized one tract system, though not to the exclusion of others, such as the pyramidal system, the extrapyramidal system or the cerebellar system. Furthermore, there are indications for improvement in the course of development and unless the child is grossly defective, the prognosis may be better than the picture in the early years indicates.

Regressive phenomena are classified as, 1. Post-encephalopathic; 2. Heller's disease or infantile dementia, and 3. A syndrome of cessation in infantile development before the age of two years.

The post-encephalopathic group did not include any case of encephalitis lethargica, since this disease had not been endemic during the period covered by this study. No two cases were alike. It appears that almost any severe infectious process, or one which may not appear severe, which occurs before 1 to 1½ years of age, may produce a general and devasting encephalopathy in the child whether due directly to inflammatory reaction to the infectious agent or to the toxic factors. We may predicate that this is due to a more open vascular system in a still rapidly growing organ. Some processes which cause focal lesions in older children appear to cause generalized lesions in these younger children. For example, whooping cough at the age of three months was associated with general convulsions, caused a post-encephalitic-like behavior with high-grade deficiency; it seemed to respond partially to fever therapy at the age of four years. Another infant had whooping cough, influenza and generalized adenitis from 8 to 18 months. She was left with a mild generalized spasticity, right facial weakness, hyperkinesis, behavior disorder, a mentality which remained stationary at 18 months and a dilated fourth ventricle revealed by encephalogram. Two children with meningococcus meningitis, under one year of age, had internal hydrocephalus; one was low-grade and died at four years, the other was a high-grade defective and could have gotten along in her own home if she had had a good one. Erysipelas with otitis media and pneumonia from the age of five months to a year resulted in retarded mental development and

hyperkinesis. Recurring attacks of carbunculosis at 4 months, 8 months and 14 months resulted in epileptoid phenomena starting with the last illness, and a cessation of mental development in a child who was precocious in her early development.

Children given the diagnosis of Heller's disease ran a typical course. Family history was of doubtful value. The child developed normally or might be superior until 3 to 3½ years; regression starts and progresses rapidly for about 6 months back to about the 18th month level. All speech, social adaptation and habit training are lost, and the process becomes stationary without any neurological disturbances even in facial expression. In one case the process was not modified by metrazol treatment.

Another group of children seemed to show a somewhat similar process but at a lower age level. Four of these children showed a somewhat slow development until about the age of 18 months. Walking may have been normally or slowly attained. Speech was entirely absent, or may have developed to the use of about twenty single words. There may have been no habit training or only partial toilet training. At about two years the developmental process seemed to stop or even regress a little, leaving here, too, a mental age of about 12 months in a child that looked in its physical development and neurological status quite normal. The point of cessation of development may have been marked by a few isolated convulsions, by an accident or illness such as otitis media, to which the mother tended to ascribe the loss of habit training and speech.

Syphilis was never a factor in the mental defective cases observed by us: in three cases where the mother was known to have syphilis, there was no evidence of transmission of the infection to the children studied in this series.

Epilepsy as a specific condition was also not recognized as an etiological factor. Epileptic phenomena were observed in connection with some types of gross brain pathology but tended to burn itself out in one to two years.

Organic brain disturbances without mental deficiencies occurred in 42 children. In general these were the same type of problems observed in the mental defective group, except that the process was not so severe or generalized or had a somewhat different distribution or occurred at a later stage in development. Eight children had congenital anomalies, two of these had congenital hydro-

cephalus with behavior disorders related to environmental inadequacies. One child made a normal adjustment when the environmental conditions were slightly improved, the other had two convulsions at long intervals and regressed mentally and developed a right hemiplegia. Two girls with a multiplicity of congenital anomalies including harelip, cleft palate, with epilepsy on one hand and club feet and Schuller-Christian disease on the other, could have made an adequate home adjustment if they had had good homes.

Congenital language disabilities are included in this group. They represent a great range of cerebral deviations at the physiological level, and are very hard to diagnose except by those exceptionally experienced. Many of these children are not sent to us until after the age of six years, when an effort is made to admit them to public schools, by parents who still have a conviction that although the child does not talk, he is not mentally defective. This group included a case of congenital word deafness, referred to a deaf school where he is doing well enough, and two cases of congenital motor aphasia. These children showed normal or slightly retarded motor development, with some almost unclassifiable motility disturbance, not always but often associated with left-handed problems. They were hyperkinetic, and presented special behavior disorders due to poor social development and inadequate understanding by those who cared for them. They were related to reading disabilities and showed similar behavior problems. Some of our problem preschool children whose hyperkineses and infantile asocial behavior had no other explanation, have since proved to be reading disabilities, indicating that the personality difficulties are not all in reaction to the reading difficulties but are part of the syndrome. These language disabilities are looked upon by us as developmental lags, the indications being for steady improvement, but there being a great need to deal with the personality problems with insight as early as possible and to furnish special training for the disability itself or for compensatory abilities.

Little's disease presents the same problem here which was already mentioned in the defective child, it being evident that these children will improve in general motor control, intelligence and personality development as they mature; but various types of special

and corrective treatments and training are needed for each functional disability.

Endocrine discrasias in the non-defective child are even less specific than in the defective. Masked hypothyroidism has seemed to account for retardation in growth which tends to correct itself sometimes with treatment and sometimes without. Pituitary-like disturbances also tend to disappear with the process of growth. The personality disturbance needs treatment directed at the specific personality problem. We look upon these deviations as possible unevennesses in growth, causing discrepancies in different somatic systems.

Birth injuries play the same rôle here as they did in the high-grade defective child. This is especially true in the premature baby. Both mental and physical development are inadequate; the IQ may remain below that of the family average. Hyperkinesis and infantile personalities occur.

Also the non-specific encephalopathies present problems similar to those of the defective children. Again, each case is a special problem. Whooping cough may produce a single localized lesion in a child of four with right hemiplegia and aphasia and complete recovery in two months: or it may produce a generalized picture of amentia in a child of 18 months, but which may gradually improve to the age of 8 years, when neurological signs of spasticity remain, with mild hyperkinesis and some retardation in speech although the child is beginning to read and write. Chicken pox at three years was followed by a dramatic schizophrenic-like psychosis which disappeared after several months, possibly due to help with fever therapy. Meningococcus meningitis at 5 months left bilateral deafness and slight cerebellar signs in a girl otherwise normal at three years. Double pneumonia with double mastoiditis in an 11-months old baby produced a prolonged chronic illness with chronic interstitial lipoid pneumonia, and left the child with an internal hydrocephalus shown by encephalogram, partial optic atrophy, partial deafness, generalized spasticity, hyperkinesis, but a normal intelligence and a tendency for progressive improvement which has still not reached its maximum at the age of six years. Neurotic phenomena characterized his relationship with his much concerned mother, which required as much therapy as his motor disabilities and social retardation.

Behavior Problems with Normal Intelligence.

Ninety-two children are included in this group. The average age on admission, the racial distribution and ratio of boys to girls is the same as for the nursery group as a whole. One-half of these children came directly from their homes, 20 per cent were sent through the children's court as neglected children, and 30 per cent were referred because of behavior problem in a foster home or an institution. Excluding the grossly neglected children, who showed evidence of malnutrition, the general health of the group was adequate.

Twenty-eight of these children came from homes showing little evident pathology, in that of all but five cases the parents were living together, and the financial and social status was average or better than usually found in our cases. The pathology was found to lie with the mother, who proved to be a neurotic person, unhappily married and personally dissatisfied. As a result, separation was often threatened and quarreling was always present in the home. Toward the children she showed resentment, attempting to cover this with overprotection and preoccupation with physical ills in the child. As would be expected, the children were typical examples of severe neurotic behavior in response to the mother's ambivalence and hidden hostility: *i. e.,* they showed sleep disturbances, head banging, thumb sucking, feeding disturbances, regression in toilet training and temper tantrums. The precipitating factor which brought out the distressing problem for which each child was admitted, was difficult to isolate, as the children had been problems for a long time before admission. In seven cases, it was rivalry with a younger sibling. It was probably often due to some crisis in the mother's emotional life which she did not confide to us. In five cases the mother was pregnant. Generally, it seemed to be a summation of conflicts arising from the family insecurity, and was brought to a climax because of the child's inability to resolve the edipus situation. It is interesting to note that 11 of these were "only" children. Under the socializing influence of the nursery group, these children lost much of their anxiety and neurotic habits and were returned to their parents with the acute symptoms relieved. In some cases we succeeded in giving the parents a little insight and were able to help

them arrange a more healthful program for the child, such as nursery school training, and these cases continued to make good adjustments. In other cases parents could not accept help because of their own conflicts, but the immediate distress was relieved, and the parents recognized the value of a psychiatric contact and returned when problems again arose.

This group includes the children of IQ range, from 110 to 150 per cent. Children from the above type of home were of average to superior intelligence, with five exceptions—which is in direct contrast with the following groups: those admitted from social agencies for placement, those remanded from the children's courts, and those from child-caring agencies, where the average IQ is only 78 to 86 per cent. This seems to indicate that children from foster homes are below average intelligence, but this is certainly not true. It indicates rather that where the parental rejection is so obvious as to require foster care, the brighter child can accept the fact, and make a good adjustment in a foster home or institutional placement without the severe emotional conflict he might have developed with an anxious ambivalent mother, while the duller child suffers more severely in the same situation and is unable to adjust himself to rivalry situations in institutions and foster homes, so he manifests attention-getting behavior. This is the type of problem frequently sent us from the better child-caring agencies. In these cases, observation in our nursery group is very valuable, since we can determine what situations precipitate the child's difficulty, and to what age of children and what type of person he best responds, and thereby assist the agency for a happier placement.

Some dull children sent to us from the courts as neglected, suffer so severely from neglect and abuse in their own homes that when first removed they are so retarded in their development that it is difficult to determine, without extended observation, if they are mentally defective. Four of the children under two years of age had no speech, and one was unable to walk. When first placed with the nursery children they were mute, afraid, inhibited in play and without any kind of habit training. With the special attention of our nursery set-up, such children begin to develop rapidly and suddenly appear to find themselves, play freely, learn to talk and in a few cases where we kept the children long enough to obtain a series, the IQ was noted to rise. Mary, age 12 months, showed an

increase in IQ from 67 per cent to 80 per cent in three months and Eugene, age 22 months, an increase in IQ from 75 per cent to 85 per cent in four months.

Two special problems were referred to the ward from two child-placing agencies. One came from an agency without psychiatrically trained workers, and where there apparently is no effort to make the child feel secure. In fact, there is a feeling that no attachment should be allowed to develop between the child and the boarding home so that by the time the child is five years old, he has no attachment to anybody and no pattern of behavior. This happens to apply only to boys from this agency, and even when the IQ is high. Another special group consisted of children placed in infancy in the Jewish Foundling Homes. These children are given the best pediatric care and are good physical specimens, but they have been deprived of social contacts and play materials, and as a result they show delayed speech, and retardation in all behavior patterns. At about three or three and a half years of age, they are placed in a foster home, to which they often cannot adjust, and are subsequently tried in five or six homes, each time becoming more of a problem. These children are unable to accept love, because of their severe deprivation in the first three years. Some finally adjust with a very tolerant mother, where they are not in competition with children their age: but ten of these children were finally referred for observation with us. They have no play pattern, cannot enter into group play but abuse other children, and cling to adults and exhibit a temper tantrum when cooperation is expected. They are hyperkinetic and distractible; they are completely confused about human relationships, and tell of half a dozen mothers and fathers, and say everybody is their brother and sister. They love only themselves and lose themselves in a destructive fantasy life directed both against the world and themselves. This type of child does not respond to the nursery group and continues overactive, aggressive and asocial. Our follow-up studies showed that some of these children finally settled down to a life in an orphan home, some were accepted by particularly understanding mothers, but all remained infantile, unhappy and unable to adjust to other children or the schoolroom. We have classified these children as psychopathic personalities, due to emotional deprivation during their early formative years.

The children from the foundling hospital show interesting features in the curve of their IQ ratings taken over a period of years in the course of their development, indicating the intellectual as well as emotional retardation which they suffer because of the non-stimulating routine environment of the nursery years. Harvey was placed at birth in the Foundling Home. When examined there at the age of 3 years, his IQ was 78 per cent. He has been reexamined at intervals and now, at the age of 8 years, his IQ is 88 per cent. Lionel's IQ has risen from 68 per cent at the age of 2½ to 82 per cent at the age of 4. Sylvia's IQ was 75 per cent at 3 years of age, 84 per cent at 4½. Aberdeen's IQ was 68 per cent at the age of 4, 82 per cent at 5, and 86 per cent at 6½. Aaron's IQ was 93 per cent at 5 years of age and 110 per cent at 6½. Since the oldest of the children of this group is still only 8 years old, we cannot say at what age the maximum will be reached, for all of the cases followed to date still show a rising IQ. The same trend is noted in children coming from the changing boarding homes. We have been able to follow some of these children longer, as they came to us at a little older age, and note they tend to show a drop in IQ at about the age of 9, due possibly to poor school adjustment and social immaturity.

The family history of children who were either referred for placement, or referred by child-placing agencies, all showed severe pathology, such as psychoses, usually schizophrenia and mental deficiency. One deteriorated epileptoid mother had sexually abused her five-year-old boy. A mental defective mother had neglected and severely beaten her three-year-old child. Others were psychopathic, alcoholic, criminal or otherwise deemed unfit to care for their children. Thirteen of the children who showed psychopathic personalities were illegitimate, but we felt this was important only because it necessitated early institutional life which was the real cause of the psychopathy in the child.

Conclusions.

This is an analytical and follow-up study of 250 children of preschool age, from an observation nursery of a psychiatric division of a city hospital, covering a five-year period.

Half of these children were mentally defective, and the majority of these were transferred to suitable state institutions. This ser-

vice could undoubtedly be rendered in many instances without an observation ward. However, in many cases apparent retardation was found to be due to neglect in very poor homes or isolation in institutions, and tended to correct itself in the ward situation which we had to offer. The experience of the staff of psychiatrists, pediatricians, psychologists and nursery teachers and nurses was further enriched by the group of more or less obviously defective children, enabling them to better evaluate, treat and prognosticate borderline problems, children temporarily retarded and many non-defective organic problems, as well as older children who came with similar but less severe problems, often with a less well-defined history.

In regard to children with mental deficiency and organic brain disease, special insight was gained in many problems such as the relation of prematurity to behavior disturbances and developmental tendencies, the significance of non-specific encephalopathies in early infancy, some types of infantile dementias, special language disabilities and many significant social problems such as illegitimacy, early institutional care, the neglected negro infant, etc., and the developmental curves of intellectual functioning.

Among the non-organic and non-defective problem children under the age of 6, several points are worthy of emphasis.

From foundling hospitals which institutionalize the child the first few years, or from child-placing agencies not sufficiently psychiatrically minded to give emotional security to their young children, we have a series of special behavior problems of very severe grade with infantile, hyperkinetic and asocial features, which are resistive to therapy and which we designate as the psychopathic personality of childhood. These children also show a retardation in IQ which tends slowly to rise until about the age of 9, when it may fall due to poor school adjustment, social immaturity and distractibility. These children, who are serious social menaces, cannot be cured but their behavior disorders could be prevented.

Dull children from the best type of child-placing agency seem to suffer from the usual mechanisms of rejection, rivalry, and feelings of inferiority for which the foster homes do not seem, in some cases, to offer sufficient compensation or understanding. Such children respond to the service and recommendations we have to offer.

Neglected young children sent to us from the children's court often show apparent retardation and emotional blocking due to association with grossly psychotic, defective or psychopathic parents but respond readily to the care offered them.

A remaining group of bright children are referred from their own homes due to the usual neurotic disorders of this age, often much exaggerated. They are children from homes of quarreling, infantile parents or severely rejecting mothers who never wanted the child from the first. They are often "only" children. They require a long course of supervised psychotherapy either in their own or another home, but are finally responsive.

One of the greatest functions of this service is that it has given us a deeper understanding of the infant and early child neurophysiology, intellectual and emotional development, and the child as a unit of a social group. We have learned that the infant cannot be raised in an institution without risking his normal personality development; we have learned that the only safeguard for the normal development of a child is a unified and continuous home environment for the first several years. The lack of this can never be compensated for. The child may be abused by psychotic, criminal and defective parents and may recover, however. A dull child may need more than the average foster home can give him. A bright child suffers from quarreling and rejecting parents but may respond to therapy with or without a change in the environment.

For mental deficiency and/or organic brain disease in childhood there is no simple formula. There are innumerable syndromes which we have only begun to classify. Each syndrome carries with it its own family social- and psychopathology, its own brain and somatic structure, its own developmental curve and its own behavior pattern. A fuller understanding of any of these syndromes even of gross deviates may throw a strong light on our insight into children who are borderline problems and often potentially normal.

DISCUSSION.

DR. ARTHUR M. DOYLE (Boston).—Dr. Bender has carried out the formidable task of giving us a sort of geological survey of what I feel is a gold mine of material. I think herein lies the real worth of her paper. I take

it that the diamond drilling of this mine will bring forth in the future many interesting papers on a number of subjects.

I was surprised at the statement that in general the IQ tended to drop in the defective group that were under observation. My own experience has been that defective children under the observation of our clinic in foster homes tended to show a very definite rise in the IQ. In fact, the only defective children whose IQ's I have observed to drop were those in which there was some organic disease.

I was particularly interested in the normal group—92 children. Here I noted the statement that 28 of these came from homes with little evident pathology. I take that to mean there was little observable psychopathology in the parents and that the sociological background of the home was comparatively normal. I have never seen a behavior problem child or a neurotic child from a home in which there was not evidence of pathology, and this again is of interest. I wonder what factors were considered to be etiological in the development of the problems that these children presented.

I was also surprised that the brighter children tended to make a more satisfactory adjustment; that they could accept the rejection of their own homes and fit into the new atmosphere of the foster home. I hadn't observed that; I thought it was easier to adjust the defective child.

Just another point, and I think it is one of the most important in the paper. Dr. Bender makes an indictment of institutional care. She describes a group of cases in which she feels the psychopathology shown by the child was caused by the institutional care the child received. If clinics like hers will publicly and forcibly emphasize points of this kind, backing them up with their evidence, I think that we shall have more satisfactory backing from our communities in what we consider proper scientific care of problem children.

Dr. Harold I. Gosline (Ossining, N. Y.).—Dr. Bender commented on the disappointing results she had in taking care of endocrine anomalies and her feeling that these anomalies are not etiologic. I feel that Dr. Bender is quite right in this particular. The endocrine anomalies, it seems to me, should be regarded as results of some etiologic agent acting upon the soma. However, these endocrine organs should not be disregarded. I don't believe the finding of the endocrine anomaly should be the end of the endocrine investigation because not only these organs but any other organ that may be diseased may be treated as if it were an indicator of etiology. I like to call these other organs indicator organs. The investigation of these endocrine changes should be continued to a point of discovering the etiology with the notion that the same etiology may be the cause of the behavior disorder, by operating on the brain and those other parts of the body whose functioning is expressed as behavior.

Dr. Lauretta Bender (closing).—May I thank the various discussants for their kind remarks and for bringing out points that I am very glad to have emphasized and which I did not have time to. With regard to the question of the IQ dropping, these children were all under the age of

6 years, and the younger the child comes to a ward like ours, the more serious the problem. A good portion of these children had organic brain disorders. On the other hand, if we think of the familial mental defective, over the age of 6, and if we think of the children coming from defective homes and from institutions, one would expect their IQ to rise if one puts them in a favorable environment.

Now, as to the statement that 28 children of higher IQ's came from homes that had no evident pathology, by that we meant there was *no gross social pathology*. That is to say, that the home is not grossly broken and that the child actually came from a home in which there was a mother and a father, and in which the father was working and in which the economic level was fair depending on our present standards. In every single instance in the children in this group under the age of 6 who came to us the quarreling between the parents and the psychopathology in general was very gross. Our problem as to what was the precipitating factor at the minute the child was referred was not always clear, but it looked as though the child had been subjected to the same gross emotional pathology since the day it was born. In some instances it was a case of another pregnancy.

Now the statement that brighter children make a better adjustment in boarding homes surprised us too. We did not know that until we analyzed this material, and I think it is a significant finding.

My indictment of the institutional care has gone so far in my emotional attitude toward this problem that I rarely rise before an audience of two people or more without emphasizing the point that the foundling child should not be placed in an institution beyond the age of 5 months if it can possibly be helped, that it should go into a boarding home where it will have security, emotional security, love and attention, and that under no condition, if it can possibly be avoided, should the situation be broken until the child makes a good school adjustment.

THE BULGARIAN TREATMENT OF PARKINSONISM WITH SPECIAL REFERENCE TO ITS EFFECT ON MENTAL SYMPTOMS.*

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A preliminary report [1] of the use of a commercially prepared extract of belladonna alkaloids in the treatment of parkinsonism was made by one of us in 1939. In that presentation we reported our results with this preparation in thirty-five typical cases of this disease. In those cases, emphasis was placed largely on the objective changes brought about by its use. In this discussion we present a summary of seventy-five cases, similarly treated with a comparison of the results obtained in this larger number. Especial attention will be directed to the effect of the treatment on the mental symptoms in Parkinson's disease. Thirty-five of the cases reported here were also used in our preliminary report, but there has been some change in the previously reported results after the longer use of the drug.

Ivan Raeff,[2-4] a plant collector in the Bulgarian village of Chipka, in 1926, described his treatment of Parkinson's disease with the extract of belladonna root. He is said to have achieved considerable success and fame throughout Europe, so much so that the Queen of Italy became interested in his work and in 1935 established a special hospital for this disease in Rome. It was there that the Bulgarian method of treatment of parkinsonism was studied clinically and pharmacologically by Panegrossi.[4-5] This treatment has been used on a national scale in Italy and in 1937 a hospital in Germany was opened for its exclusive use.[6] The results reported in Italy and Germany have been uniformly good,

* Read at the ninety-sixth annual meeting of The American Psychiatric Association, Cincinnati, Ohio, May 20-24, 1940.

and some investigators have made the rather remarkable claim that 80% of their patients so treated have been able to go back to work.

We may not be entirely correct in giving the title "Bulgarian treatment" to this work, as literally the method originally described employed the use of a white wine extract of whole belladonna root, whereas the preparation which we have used in our cases is a compounded tablet known as Rabellon,* containing the purified alkaloids atropine, scopolamine and hyoscyamine, extracted from the belladonna root, recombined in tablet form in the same proportions as found in a fresh white wine extract of Bulgarian belladonna root. Rabellon contains three milligrams of total alkaloids per cc. 0.1 milligram total alkaloids is equivalent to approximately one drop of the solution or ¼ tablet. Consequently one tablet is equivalent to 0.5 mgm. The preparation was first used in liquid form, but later was changed to the tablet as the manufacturers advised that the solution was less stable than the powder.

There apparently is some difference of opinion as to the source of the best belladonna root—some prefer that from the neighborhood of Chipka, Bulgaria, but most investigators think that it makes no difference where the root is grown. It is possible, of course, that climate, soil, and other circumstances influence the alkaloidal content of the root. Vollmer [8] interchanged extracts of Bulgarian and American belladonna root in the same patients without affecting the results. Denis Hill [9] found no difference in his clinical results when he substituted the English for the Bulgarian belladonna root. Ferrannini [2] and di Mattei,[11] both used the Italian root with as good results as they formerly got with the Bulgarian product. Neuwahl and Fenwick [7] also used the English root with good success.

Tocco,[3] and Neuwahl and Fenwick [6] believe that the method employed by Raeff in the preparation of his so-called Bulgarian belladonna extract eliminated atropine, but this contention is not substantiated by others. Kuhn and Schafer [12] believe that the therapeutic value of belladonna root lies in the preponderance of the hyoscyamine which it contains. Neuwahl and Fenwick [7] in a

* Sharp and Dohme, Philadelphia, Pennsylvania.

later paper believe that the standardized extract they are now using is better than the former decoction in white wine.

Unquestionably, there is a difference in the tolerance of the extract of belladonna in different individuals. It is well known that the aged, the arteriosclerotic and the alcoholic tolerate the drug poorly. For that reason those individuals with an arteriosclerotic type of parkinsonism are unable to take as large a dose of the product as younger persons, which may account for the fact that they show less clinical improvement than those having the postencephalitic syndrome. It is remarkable how large an amount of the drug can be taken without toxic effect by those who tolerate the drug well.

It is of interest that the individual alkaloids of belladonna do not produce the same therapeutic effect as when given in combination. The thought has been expressed that they may have a synergistic effect upon one another. Clinical observation seems to definitely indicate that the combination of the several alkaloids gives decidedly the better results. Von Witzleben [13] reported that the extract of the whole root was not only more efficacious, but also less toxic than the individual alkaloids. The known alkaloids of the belladonna root have been used separately for years in parkinsonism with varying results. Scopolamine is certainly of value. Atropine in large doses was first used in this condition in 1925, and it is generally agreed that individuals with postencephalitic parkinsonism can tolerate more of this drug than individuals not so affected. Bremer,[14] Roemer [15] and Kleeman [16] of Germany were among the first to report that large doses of atropine were helpful in this disease. One of them gave a patient as much as 120 mgm. of atropine a day without toxic effect. In many patients the extreme dryness of the mouth, the dilatation of the pupils, the blurring of vision, and gastro-intestinal disturbances are often so disagreeable as to make the atropine treatment impossible.

It is our custom to start the patient on $\frac{1}{4}$ tablet, approximately 0.1 mgm. of the total alkaloids, three times a day, and gradually increase the amount until the patient gets definite improvement, or until the point of toxic tolerance was reached. However, if patients were taking atropine or scopolamine at the time they were put on this drug, it was easier to start them on larger doses. It is impossible to determine a standard dose of belladonna alka-

loid as the tolerance of each individual differs as does the dose at which the maximum improvement was obtained. One very interesting case did poorly on a large dose, but there was a complete cessation of tremor and a definite subjective improvement when ¾ tablet or slightly over 0.3 mgm. was taken three times a day. In this patient, when a larger dose was again given, the tremor returned. No other case in our series behaved as this one did. When the minimum dose which is most effective in a given patient is discovered, it should be maintained. It is possible that this optimum dose can be found if the patient is observed closely.

There were no untoward results from the use of the drug other than that four of our patients had a partial cessation of urinary secretion when taking a large quantity of the drug, several were made more nervous and one patient developed a dermatitis which was probably not related to the taking of belladonna root extract. Some few patients were unwilling to stand the uncomfortable dryness of the mouth, and the blurring of vision;—this was particularly true in several of the arteriosclerotic cases. It is possible that they might have shown some improvement had they been able to take larger doses or have been willing to take the drug a longer time. Our patients were given no special diet, there was no change of environment. Practically all of them had had most all types of the symptomatic treatment usually given for parkinsonism. While taking Rabellon they were given no other drug.

Aside from our preliminary report, there have been articles on this subject published in this country by Vollmer,[8] Fabing,[10] Forster,[18] Neal,[17] and Draper.[19] The results obtained by these investigators were uniformly good with the use of the extract of belladonna root. Three of them used the same preparation which we employed. Neal [17] reported seventy-five patients, all with post-encephalitic parkinsonism. All of them showed some degree of improvement. Vollmer [8] reported sixteen cases of post-encephalitic parkinsonism with fourteen showing both objective and subjective improvement. Most of his cases took up their former employment and lost all symptoms. A concert singer went back on tour after several years of incapacity and unemployment. One patient was unimproved and one discontinued treatment after several days. He also reported ten cases of parkinsonism of the arteriosclerotic type.

Seven showed improvement while two were unimproved, and one discontinued treatment. Forster [18] reported seven cases of post-encephalitic parkinsonism, all of whom showed definite improvement in saliarrhea, dysphagia, muscle pain, muscle rigidity, tremor, gait and expression. Draper [19] reported his results in the treatment of seventeen cases with this preparation and concluded that it is the most effective treatment he has used in this condition.

Through the courtesy of the manufacturers of Rabellon we were furnished a supply of this drug before it was procurable commercially. We have used it for more than a year and during this time we have treated a total of seventy-five patients of all varieties of paralysis agitans. All of the patients were typical examples of the disease and most of them showed the usual disturbance of gait and posture, and change of expression. Several showed oculogyric crises. Twenty-eight of them were committed cases in mental hospitals, the remaining forty-seven were ambulatory patients, seen either in private practice, in the neuropsychiatric division of the out-patient department of the Medical College of Virginia, or in the private practice of several friends. There were thirty-one female and forty-four male patients; our youngest patient was 20, and our oldest 72. The larger number were in the 30-40 age group, two of them were over 70 years of age; eleven of the patients were colored, and sixty-four were white. Forty of them were of the post-encephalitic variety; eighteen were of the degenerative or arteriosclerotic type; fourteen were diagnosed post-encephalitic parkinsonism with psychosis, and three were of the arteriosclerotic variety with psychosis. Thirty-two had had no previous treatment, whereas the others in the series had had either one or more combinations of the accepted forms of therapy such as stramonium, scopolamine, atropine, benzedrine, cobra venom. Of the fifty-two patients who had previously had various forms of therapy, thirty-four had shown from mild to marked improvement on other forms of treatment.

Thirteen of our patients of the several types showed no objective or subjective improvement and twenty-three showed no subjective improvement with the use of Rabellon. A few of this number did not cooperate and take the drug long enough to be of the slightest benefit because of the disagreeable symptoms of dryness of the mouth or blurring of vision. Three were made

more irritable, and for that reason the drug had to be discontinued, one was more confused and another showed more mental inertia. The duration of treatment has varied from less than a week to more than a year in many of these patients. The highest dosage was 11¼ tablets or 5.6 mgm. a day which two patients tolerated well.

Aside from a very few cases in our series, noticeably those that we will show in the motion picture, the subjective improvement was decidedly more considerable than the objective improvement would warrant. Of the fifty-four cases of the post-encephalitic type, forty-five showed objective improvement, varying from a slight lessening in the muscle tone to enabling the patient to walk about and dress and feed himself after having been bedridden for years. The improvement in handwriting was most striking in many of the patients whose tremor was lessened. Several were unable to make a legible scrawl before taking Rabellon, but were able to write quite legibly after its use. (See Figs. 1-4.) Of the post-encephalitic variety, forty patients showed subjective improvement. Of the twenty-one cases of the degenerative or arteriosclerotic type, seven showed some subjective improvement, and eight were objectively better. Most of the patients with oculogyric crises were benefitted materially in that this symptom ceased entirely, was less severe in intensity, was less frequent, or was of shorter duration. Several patients were rid entirely of their tremor, the saliarrhea was relieved in most of those who complained of it. Of the fifty-four postencephalitic cases in our series, six showed no improvement, either objective or subjective. Of these there were thirty who showed no objective improvement, while twenty-four showed no subjective change while taking the drug. All symptoms returned in every patient to as great a degree as before treatment when the drug was withdrawn. Several of the patients had had the disease for twenty or more years and one of them had been suffering for only six months.

The mental picture accompanying parkinsonism is not a very constant one. There is usually some disturbance in the emotional tone, and to a lesser degree there is an involvement in the intellectual sphere in a few of these individuals. In many of the older

arteriosclerotic parkinsonian patients there is a psychosis of the cerebral arteriosclerotic type with intellectual deterioration—only three of our patients belong to this group. The post-encephalitic variety may be accompanied by a psychosis of any of the various classical types. The patients with mental symptoms which we wish to consider in this paper, however, are those with mild emotional disturbances, consisting largely of anxiety, irritability, sleep disturbances, depression, mental fatigue, and of loss of memory and mental sluggishness.

This mental improvement in our patients consisted of improved sleeping, clearer thinking, increased cheerfulness and hopefulness, less irritability, more sociability, more mental alertness, less depression, less emotional instability, less fear and anxiety and more cooperation. The subjective improvement of symptoms was more apparent in both types of patients in spite of the fact that a greater percentage of them showed objective improvement. There were some notable exceptions to this.

COMMENT.

It may be interesting to theorize as to what effect belladonna root preparations may have on the nervous system causing improvement in these patients. In spite of the known action on the central nervous system of belladonna preparations, it is possible that the beneficial effect of these alkaloids is due to the peripheral rather than to the central action. We know that atropine inhibits the action of acetylcholine and hence acts as a depressant to the parasympathetic nervous system. If the belladonna extract acts in a similar way, interfering with acetylcholine activity at the myoneural junction, it is conceivable that this may have some effect in decreasing muscular hypertonicity and tremor. I realize that any action of acetylcholine on striated muscle is as yet not proven. It should be recalled, however, that myasthenia gravis improves under physostigmine therapy, and that this, like the belladonna alkaloids appears to act through the sympathetic nervous system. The rather converse action of these drugs is most suggestive and indicates the need for further study.

FIG. 1.—Photograph of patient's attempt to sign his name before treatment with belladonna alkaloids.

FIG. 2.—Photograph of signature after ten days of treatment with belladonna alkaloids.

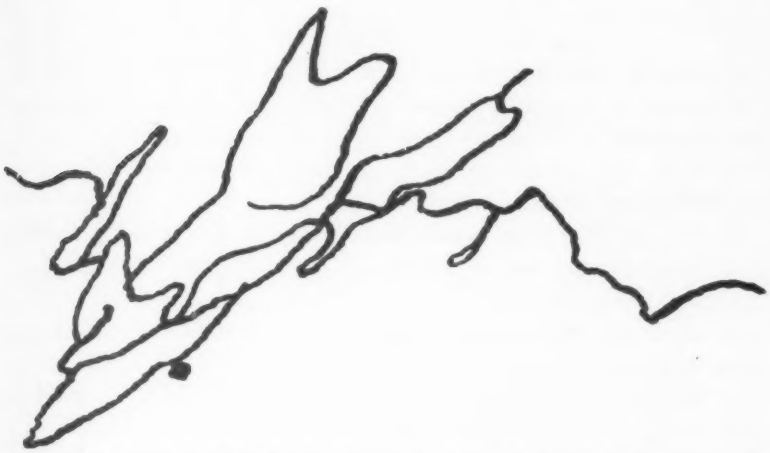

FIG. 3.—Photograph of patient's attempt to sign his name before treatment with belladonna alkaloids.

Must I now in grief
depart
and find relief for
this broken heart
To some other fair one
you asked me to go
to try and heal this
mighty woe
You know not what
you asked me to do
Gbert I cannot leave
but you
Landon Henduen

FIG. 4.—Specimen of patient's handwriting after ten days of treatment with belladonna alkaloids.

FIG. 2.—Photograph of signature after ten days of treatment with belladonna alkaloids.

CONCLUSIONS.

We have used belladonna root extract in the treatment of parkinsonism over a sufficient length of time and in a series of cases sufficiently large for us to draw these conclusions:

1. The mild mental symptoms in most of these patients were materially benefitted.

2. The most striking results were obtained in several bedridden cases, who by the use of the drug, were enabled to walk, dress and feed themselves.

3. In all patients there was a return of symptoms when the drug was withdrawn.

4. In this larger series, our results were not quite as good as they were in cases previously reported by us.

5. The degenerative type of the disease did not respond to the treatment as well as the postencephalitic variety, nor did that type tolerate the drug as well.

6. It is our opinion that this drug is decidedly more efficacious as a palliative treatment than the single alkaloids or other drugs which have been used in this disease.

Acknowledgment is hereby given to our co-workers in the Department of Neuropsychiatry at the Medical College of Virginia, to the superintendents and clinical directors of the Central State Hospital and the Southwestern State Hospital in Virginia, and to several colleagues who treated several cases in this series.

BIBLIOGRAPHY.

1. Gayle, R. Finley, Jr.: Va. Med. Monthly, 66: 707, 1939.
2. Ferrannini, Luigi: Policlinico, Rome (sez. prat.), 42: 967-1544, 1935.
3. Tocco, Luigi: Rossegna di terap. e pat. Clin., Naples, 8: 154, 1936.
4. Panegrossi, Guissepe: Policlinico, Rome (sez. prat.), 42: 56, 1935.
5. ——— *Ibid.*, 42: 506, 1935.
6. Neuwahl, F. J., and Fenwick, C. C.: Lancet, 2: 619, 1937.
7. ——— *Ibid.*, 1: 693, 1939.
8. Vollmer, Hermann: J. Mt. Sinai Hosp., 6: 93, 1939.
9. Hill, Denis: Lancet, 2: 1048, 1938.
10. Fabing, H. D.: Ohio State Med. Jol., 35: 1195, 1939.
11. Di Mattei, Pietro: Policlinico, Rome (sez. prat.), 42: 501, 1935.
12. Kuhn, A., and Schafer, G.: Münch. med. Wchenschr., 85: 744, 1938.
13. Von Witzleben, H. D.: Klin. Wchnschr., 17: 329 and 369, 1938.

14. Bremer, F. W.: Deutsch. Archiv. f. klin. Med., 149: 340, 1925.
15. Roemer, C.: Münch. med. Wchenschr., 77: 2156, 1930.
16. Kleeman, Anna, and Lovenstein, H.: Deutsch. med. Wchnschr., 57: 1014, 1931.
17. Neal, Josephine: New York State J. Med., 39: 1875, 1939.
18. Forster, F. M.: Penna. M. J., 43: 67, 1939.
19. Draper, Paul A.: Rocky Mt. M. J., 37: 272. April, 1940.

DISCUSSION.

DR. WALTER J. FREEMAN (Washington, D. C.).—The history of belladonna treatment dates back to about 1923, when I saw the first cases treated. I was going on a different scheme. I was using drugs that would paralyze the sympathetic system or the neuro-muscular junction, trying out such things as cicutine, from hemlock bark, or nicotine. Dr. Gayle didn't mention the question of tobacco, but I found an enormous increase in the rigidity in cases in which nicotine was used.

Rabellon, as you may recall, is about 90 per cent hyoscyamine, 5 per cent atropine, and 5 per cent hyoscine. The proportions may be a little wrong. However, the point is that hyoscyamine has previously been considered a rather inert drug in this disorder.

I was one of the fortunate ones who received a supply of the liquid Rabellon before it was placed on the market, and was able to try out this treatment in a series of approximately four cases. The results have not been uniformly good. No treatment I think is uniformly good in this condition. However, I was able to draw some conclusions which are in the main in accord with those of Dr. Gayle.

In the first instance, the most severely affected cases responded best. If you find a patient who is only slightly stooped and slightly slowed up and slightly irritated by his inability to carry on his normal activities, he doesn't get quite as much result as does the patient who is severely affected by the disease and whose moderate improvement is a blessing to him.

In the second place, the individuals with rigidity are much more happily affected than those with tremor. The tremors continue. The rigidity is lessened.

As Dr. Gayle found, the arteriosclerotic variety and those old individuals do not respond so well as does the postencephalitic variety.

Among the toxic symptoms have been mental depression, confusion, delusions of persecution, hallucinations, particularly of touch. Some of these individuals will show very much the peculiar idea that there are bugs crawling on the skin and under the skin.

I would say that about 60 per cent of the patients are improved subjectively and objectively. Some of them have discontinued in favor of the hyoscine or belladonna. Some have discontinued for purposes best known to themselves.

Dr. Gayle and Dr. Pettis are to be commended for their ability to persuade patients to continue with the treatment in spite of discomforts due to dryness of the mouth and dilatation of the pupils and paralysis of the accommodation.

Rabellon seems to stand midway in its toxic effects between the drying effects of atropine and the cerebral or mental effect of hyoscine. Therefore, I consider it for most cases the best treatment.

One thing further, in those who have received hyoscine in fairly large doses over a rather prolonged period, the change to Rabellon is sometimes made with some difficulty because of the habituation of the patient to the previous drug. Where the patients are in a hospital environment and the medication can be controlled, well and good. Where they are on the outside sometimes the transition is made with some difficulty.

Altogether I think this total extract of the root of the belladonna is a distinct improvement in our mental therapy, but it is not going to prevent us from going ahead and trying to find something still better.

Dr. M. A. Zeligs (Cincinnati, Ohio).—I congratulate Dr. Gayle and Dr. Pettis on this bit of work. Dr. Fabing and myself, in this city, have been carrying on similar studies in the past two years. During that time we have seen about 50 patients with post-encephalitis, and we have been using a product which is similar to Rabellon, but which has been prepared by a different house, and our results correspond well with those obtained by Dr. Gayle and Dr. Pettis.

We have found that the instillation of one per cent solution of pilocarpine in the eyes is very helpful in relieving the mydriasis and paralysis of accommodation. Also the adjunctive use of prostigmin will tend to relieve some of the intestinal striation which is commonly seen when higher doses are used.

I should like to ask Dr. Gayle whether the recent Rabellon is not a synthetic product different from the initial liquid Rabellon.

Dr. Albertine Rea (Chicago).—At the Chicago State Hospital, we began the use of this drug about February 1. We have treated seven patients in a very few months, and our findings are very similar to those of Dr. Gayle. With one exception in the seven, we have seen a marked improvement. The oculogyric crisis disappeared completely in two of the patients. The extreme salivation that so many of this group show disappeared also, but as soon as the drug is discontinued the symptoms are apt to return.

The cheerfulness noted in the patients was rather remarkable. One particular patient was extremely depressed, but became cheerful when she was able to see that she could walk fairly straight again. Two of the patients could not feed themselves, but are able to feed themselves in about the same manner that the picture showed here.

Altogether we are very willing to continue. We have not yet begun to note any particular symptoms against the treatment.

Dr. H. E. Kiene (Providence, R. I.).—I have enjoyed this paper, and I would like to ask the author about a patient I have observed over a period of 10 years. This patient has had a diagnosis of neurosis over this period of time, made by many quite competent psychiatrists. We have tried many

various remedies, at first, psychotherapy without alleviation of his manic states and other evidence of neurosis.

I suspected a mild encephalitis 10 years ago, when I first saw the patient, but at that time we did not have this preparation for treatment, and it was not used until recently. He has been tossed around so much and given so many remedies that his opinion is quite worth while in regard to the drug.

During his last admission at the Chapin Hospital, I decided to try Rabellon, and gave it to him without telling him very much about the effect that he might expect. Much to my surprise, he improved rather markedly, and on discharge from the hospital said that he had found nothing in the period of much more than 10 years that he has been under medical treatment which had benefitted him as much.

DR. R. FINLEY GAYLE (Richmond, Va.).—It is true that I did not specifically mention tobacco, but we advised our patients not to smoke and not to indulge in alcohol, or any toxic things that might disturb them.

One gentleman asked if the Rabellon was not a synthetic product. I can only answer that by saying that the literature I have read and the information I have had from the manufacturers is that it is not.

Dr. Kiene spoke of cases that for 10 years have been diagnosed as psychoneurotic and had all sorts of treatment. I think that a great many of these patients, whose symptoms have not progressed very far, give evidence of disturbance of emotional tone and psychoneurotic state, possibly without any basic psychic reasoning for it, and are shifted about and given all sorts of symptomatic treatment without results.

I have one patient in mind who acted similarly, was sent to me with the diagnosis of hysteria, and I was a little suspicious. Fortunately, in a short time, the symptoms of Parkinson's disease progressed and the diagnosis was simple.

I cannot say that I quite agree with Dr. Freeman on some of the mild cases. As Dr. Kiene said, we have had some of the very mild cases that cleared up quite well after the use of this product.

THE ETIOLOGY OF PELLAGRA.*

By JOHN G. DEWAN, M. D., Ph. D., Toronto, Ont.

During the past three or four years great strides have been made in the investigation of the cause and treatment of pellagra. This apparently sudden advance however is the result of the work of many men who have been moving painstakingly toward the goal.

Pellagra, from the Italian words "pelle agra" (rough skin) is characterized in its classic form by mental disturbance, various skin lesions and intestinal inflammation. The disease has existed for centuries, and descriptions by early writers indicate that it probably was confused with leprosy and with mental and intestinal disorders due to other causes. It was first recognized as a definite syndrome in the eighteenth century when it was prevalent in central Europe. Since the early part of the present century there has been a wide incidence of the disease in the southern United States, but it has also been observed in many lands. Furthermore it is now becoming evident that subclinical or mild cases simulating the picture of psychoneurosis are quite widespread.

Early workers in this field advanced various theories to account for the condition. One of the most widely accepted of these attributed the cause to maize or Indian corn. As corn was the exclusive diet in districts of endemic pellagra in Italy in the nineteenth century it was felt that the corn itself in some way caused the disease. In 1826 Sette suggested that a fungus acting on the oil of the grain produced a poison. Lombroso in 1872 also attributed the cause to a toxin. He concluded, "in pellagra we are dealing with an intoxication produced by poisons developed in spoiled corn through the action of certain micro-organisms in themselves harmless to man." Ceni, in 1902, said the disease was due to certain moulds on the grain. At the turn of the century pellagra became very widespread in the southern States, where the people depended on the products of their cornfields rather than on expen-

* From the Departments of Psychiatry and Medical Research, University of Toronto.

sive foods. The problem became so great from both the public health and economic standpoints that state governments initiated extensive investigations. The Illinois Pellagra Commission of 1911 concluded that the primary etiological factor was a living microorganism of unknown nature, the probable source of infection being through the intestinal tract. Again we have the Thompson-McFadden Pellagra Commission in 1913 concluding that pellagra was an infectious disease transmitted probably by a blood sucking insect.

This was the situation when the U. S. Public Health Service appointed Dr. Joseph Goldberger in 1913 to head a group of workers in the investigation of this scourge. Goldberger's studies are an example of clear thinking and of a truly scientific prosecution of a problem. He first set out to test the widely held view that pellagra was an infectious disease. He submitted sixteen volunteers to subcutaneous and intramuscular injections of blood taken from advanced cases of pellagra. He applied nasopharyngeal secretions from the patients to the mucosa of the respiratory passages of the volunteers and also exposed his experimental group to infection from epidermal scales, urine and feces. Surely if the condition was a communicable one, some at least of his group would fall ill from the disease. Not one showed the slightest symptom of pellagra. Goldberger now felt that he had cleared the way to test a theory he had regarding diet. In 1915, with the aid of Wheeler, he studied the effect of diet on convicts at the farm of the Mississippi State Penitentiary. Eleven of the prisoners were observed carefully on their regular diet for a period of two months to make sure that they demonstrated no abnormal symptoms. They were then given a diet lacking milk, meat and fruit and containing only a moderate amount of vegetables. In five months time, six of the eleven convicts developed definite symptoms of pellagra. None of the control subjects of the farm who were kept on their usual diet showed any symptoms of the disease. Goldberger next studied the effect of a balanced diet on children in three orphanages where pellagra had occurred every spring for some years. He changed the diet, adding especially fresh animal foods. No recurrence of pellagra occurred. He also demonstrated that pellagra cases could be cured by giving a balanced diet and that relapses did not occur if this diet was maintained. Goldberger and his associates[1-3] con-

cluded that in the diets that prevented pellagra there was present a factor which belonged to that group of mysterious substances called vitamins which at that time were just beginning to come to the fore in experimental work. He decided to call the unknown substance or substances the pellagra-preventive factor. He then experimented with different foods and showed that yeast, lean beef and liver were especially rich in this substance.

Now began a search to track down the pellagra-preventive factor and determine its chemical constitution. The quest was long and difficult and was pursued by a great many workers. A period of some ten years elapsed before the end of the trail was reached. Elvehjem,[4] heading a group at the University of Wisconsin, was working with liver fractions. His experimental animals were dogs suffering from "black-tongue," the equivalent of pellagra in human subjects. In 1937 he isolated from liver the amide of nicotinic acid which, when fed to the dogs, produced a dramatic healing of the condition in a few days. He demonstrated that commercial nicotinic acid was a cure as well.

The moment had now arrived to try out nicotinic acid or its amide on patients suffering from pellagra. Spies[5] and his coworkers Cooper and Blankenhorn planned to do this but they hesitated until they were sure there would be no toxic effects. They took the vitamin themselves and on determining that there were no untoward symptoms administered nicotinic acid daily to eleven pellagrins and in February 1938 reported dramatic cures resulting. Other groups of clinicians[6-12] also reported great success with nicotinic acid. The amide and the diethyl amide (coramine) also proved to be therapeutically efficacious.

Spies and his associates,[12] have made very extensive clinical studies of the effect of nicotinic acid in pellagra. They demonstrated that pellagrins frequently suffer from associated deficiency diseases, *e. g.,* the peripheral neuritis often present in pellagrins is due to an accompany deficiency of vitamin B_1. Deficiencies of other vitamins may not only be complicating conditions of pellagra but they may also be predisposing causes. They therefore recommend in addition to nicotinic acid the administration of other vitamins and a well-balanced diet. Spies,[12] is of the opinion that mild or subclinical pellagra is widespread the patients displaying

symptoms of a psychoneurotic nature and often diagnosed as such. Nicotinic acid produces prompt relief of the symptoms.

Spies concludes the primary cause of the deficiency in the patients he has studied to be "the failure to consume diet quantitatively or qualitatively adequate. This failure, although often due to financial inability to buy proper food, could be attributed in many instances, to long-established faulty dietary habits, food idiosyncrasies, chronic alcoholic addiction resulting in the replacement of food by alcohol, arbitrary diets for relief of gastric symptoms such as dyspepsia and long adherence to unbalanced diets prescribed by physicians for the treatment of diseases such as peptic ulcer, chronic nephritis, chronic colitis, cardiac disease or diabetes mellitus."

The natural question now arises: How does this small chemical compound, nicotinic acid (or its amide) produce such profound effects, restoring an excited, depressed or paranoidal patient to sanity within a matter of hours. At the present time this question has not been definitely answered. However some very interesting facts of tissue metabolism have been discovered which are very suggestive. Biochemists working especially at centres in Stockholm, Cambridge and Berlin have been investigating for the past twenty years detailed chemical mechanisms in tissues. They have found that thin slices of tissues such as brain, liver and kidney when placed in Ringers solution respire for hours providing they are supplied with substances such as glucose, which can be used as a source of energy. Since oxidation mechanisms are fundamental reactions supplying the energy for thinking processes, muscular movement, chemical synthesis, etc. it is of great importance to know something of the machinery and the wheels involved in these reactions. These workers therefore began literally to take the cells apart, isolating the various constituents and then piecing them together, thus imitating the cell. Many fascinating facts have been unearthed by this method; for example it was found that the oxidation of glucose or its breakdown products involves the transfer of two hydrogen atoms from the sugar molecule to oxygen, thus forming water (H_2O). This reaction yields energy for the normal processes of the cell. The transfer of the hydrogen atoms from the sugar to the oxygen however is not a direct one but requires the presence of "go-betweens", *i. e.*, substances which act

as hydrogen carriers bridging the gap between the glucose and the oxygen in the cell. Now a very important hydrogen carrier necessary for the oxidation of many compounds,[13-25] has been isolated from the tissues of the body. This compound contains the amide of nicotinic acid. The body is unable to synthesize this molecule and is therefore dependent on the diet for its source of supply. Thus if nicotinic acid or its amide is deficient in the diet the many oxidations requiring this hydrogen carrier are interrupted so that a condition of abnormal metabolism arises within the cells. It seems reasonable to assume that this faulty internal combustion may be reflected clinically as the symptom complex known as pellagra. However until this point has been definitely established it must remain a theory. There is always the possibility that further investigations of tissue metabolism may disclose some additional function for nicotinic acid, although up to the present there has been no such indication.

BIBLIOGRAPHY.

1. Goldberger, J., and Tanner, W. F.: Public Health Rep., XL: 54, 1925.
2. Goldberger, J., and Lillie, R. D.: Public Health Rep., XLIII: 1385, 1928.
3. Goldberger, J., Wheeler, G. A., Lillie, R. D., and Rogers, L. M.: Public Health Rep., XLIII: 657, 1928.
4. Elvehjem, C. A., Madden, R. J., Strong, F. M., and Wooley, D. W.: Isolation and identification of the anti-black tongue factor. J. Biol. Chem., 123: 137, 1938.
5. Spies, T. D., Cooper, C., and Blankenhorn, M. A.: The use of nicotinic acid in the treatment of pellagra. J. A. M. A. 110: 622, 1938.
6. Smith, D. T., Ruffin, J. M., and Smith, S. G.: Pellagra successfully treated with nicotinic acid: A case report. J. A. M. A., 109: 2054, 1937.
7. Mathews, R. S.: Pellagra and nicotinic acid. J. A. M. A., 111: 1148, 1938.
8. Spies, T. D., Aring, C. D., Gelperin, Julius, and Bean, W. B.: The mental symptoms of pellagra. Am. J. M. Sc. 196: 461, 1938.
9. Sydenstricker, V. P., Schmidt, H. L., Jr., Fulton, M. C., New, J. S., and Geeslin, L. E.: The treatment of pellagra with nicotinic acid. South. M. J., 31: 1155, 1938.
10. Spies, T. D., Grant, J. M., Stone, R. E., and McLester, J. B.: Recent observations on the treatment of 600 pellagrins with special emphasis on the use of nicotinic acid in prophylaxis. South. M. J., 31: 1231, 1938.

11. Cleckley, H. M., Sydenstricker, V. P., and Geeslin, L. E.: Nicotinic acid in the treatment of atypical psychotic states. J. A. M. A., 112: 2107, 1939.
12. Spies, T. D., Vilter, R. W., and Ashe, W. F.: Pellagra, beriberi and riboflavin deficiency in human beings. J. A. M. A., 113: 931, 1939.
13. Warburg, O., Christian, W., and Griese, A.: Biochem. Zeit., 279: 143, 1935.
14. Euler, H. V., Albers, H., and Schlenk, F.: Hoppe-Seylers Zeit., 234: I, 1935.
15. Harrison, D. C.: Biochem. J., 27: 382, 1933.
16. Andersson, B.: Hoppe-Seylers Zeit., 217: 186, 1933.
17. Green, D. E., and Brosteaux, J.: The lactic dehydrogenase of animal tissues. Biochem. J., 30: 1489, 1936.
18. Green, D. E.: The malic dehydrogenase of animal tissues. Biochem. J., 30: 2095, 1936.
19. Green, D. E., Dewan, J. G., and Leloir, L. F.: The β-hydroxybutyric dehydrogenase of animal tissues. Biochem. J., 31: 934, 1937.
20. Dewan, J. G., and Green, D. E.: Coenzyme-linked reactions between dehydrogenase systems. Biochem. J., 31: 1074, 1937.
21. Dixon, M., and Lutwak-Mann, C.: Aldehyde mutase. Biochem. J., 31: 1347, 1937.
22. Green, D. E., Needham, M. N., and Dewan, J. G.: Dismutations and oxidoreductions. Biochem. J., 31: 2327, 1937.
23. Dewan, J. G.: The l(+) glutamic dehydrogenase of animal tissues. Biochem. J., 32: 1378, 1938.
24. Lutwak-Mann, C.: The alcohol dehydrogenase of animal tissues. Biochem. J., 32: 1364, 1938.
25. Dewan, J. G.: Coenzyme-linked reactions involving l(+) glutamic dehydrogenase. Biochem. J., 33: 549, 1939.

THE MENTAL ORGANIZATION OF THE BRAIN-INJURED MENTALLY DEFECTIVE CHILD.*

(The Mentally Crippled Child.)

By ALFRED A. STRAUSS, M. D., and HEINZ WERNER, Ph. D.,
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The first workers in the field of mental deficiency were chiefly concerned with those abnormalities which are strongly correlated to a physical malformation. Accumulation of subsequent experience has shown that much mental deficiency is not accompanied by any apparent corporal defect. This is particularly true in that type of mental deficiency which has been variously called familial, hereditary or endogenous,[9] and especially among the moron and borderline group. However, it is often still considered that the so-called organic or exogenous type of mental deficiency, in which the amentia is due to a brain lesion, is linked with a visible defect in the motor apparatus. Numerous data contradict this assumption. The number of children belonging to the exogenous group who do not show gross motor disturbances exceeds the number who do show motor defects.

An unselected group of moron and borderline children at the Wayne County Training School has been examined.[11] The diagnosis of exogenous type of mental deficiency was based upon:

1. The developmental history of the child,
2. The absence of mental deficiency in other members of the family,
3. The neuropathological pattern demonstrated by clinical signs.

These data revealed that 20 to 25 per cent of the children examined had evidence of brain lesions, notwithstanding that only 3 to 5 per cent showed evidence of a gross neurological disturbance.

Moron and borderline children of the exogenous type would hardly impress anybody who is dealing with them superficially as being conspicuous within an unselected group of mental de-

* Read at the ninety-sixth annual meeting of The American Psychiatric Association, Cincinnati, Ohio, May 20-24, 1940.

From the Wayne County Training School, Medical Superintendent R. H. Haskell, M. D.

fectives of the same I. Q. range. A more intimate knowledge of their response to the environment and a clinical analysis of their mental behavior, however, reveals a personality that is fundamentally different from the personality of the endogenous type.

There are general indications that mentally handicapped children of the exogenous type do not respond readily to environmental stimulation. If we can take an increase in I. Q. as an indication that the child responds positively to our training efforts, a decrease would be an indication of either a deterioration or an imperfect training.

In a survey [11] of the first five hundred admissions to the Wayne County Training School it was found that children of the exogenous type as a group showed a decrease of 2.54 points in I. Q. during a residence in the institution of four to five years, whereas children of the endogenous type as a group showed an increase of 4.0 points in I. Q. during a similar period of residence.

In a study of children whose mental growth could be traced through a period before and a period after admission to the institution, differences between endogenous and exogenous groups were again found. Endogenous children showed a cumulative loss in rate of mental growth during the period before admission. The same cumulative loss was characteristic of the exogenous children but in a lesser degree. After admission to the institution, the endogenous group is speeding up its mental growth; whereas in the exogenous group no such change occurs.[6] These data raise the question of what factors make the exogenous child unresponsive to stimulation.

The sensori-motor function is one aspect of the behavior of the organism which permits strict and controllable observation. It is because of this fact that early mental development is measured in terms of motor performance. We have, therefore, attempted to construct tests which permit us to analyze sensori-motor performance.*

* A previous survey [9] showed that, among children whose performance age was one year or more below the corresponding mental age, more than 60 per cent were diagnosed as exogenous; whereas, among children whose performance age was three years or more above the corresponding mental age, only 5 per cent were diagnosed as exogenous.

One such sensori-motor test deals with performance on a marble board.[13] This board contains ten rows of ten holes each in which marbles can be placed. The examiner constructs a mosaic pattern which the child is requested to copy on a second board. Each move is recorded on a blank. The test consists of six patterns, one of the first showing two interlocked squares and one of the more difficult four adjacent hexagons.

The results point to a striking difference in the manner of performance between endogenous and exogenous groups. Though objectively the patterns made by children of both types may be equally correct, the analysis shows that the endogenous child uses a procedure different from that of the exogenous child. Successes and failures of the endogenous child are very similar to those of normal children of the same mental age. The endogenous child tends to proceed continuously around the outlines of the pattern. His figures, though not always perfect copies of the original patterns, are whole-forms. The exogenous child, on the other hand, constructs his pattern predominantly in an incoherent manner: he jumps from one part of the board to another; he sometimes even starts in the middle of the line. The figures he constructs are frequently disorganized patterns lacking closure, connection of parts, etc.

Children's drawings of such marble patterns and constructions of three-dimensional "tinker-toy" forms showed similar characteristics.

Are these differences due to a specific visual defect? This pathological variable was controlled by the use of tasks measuring the ability to perceive abstract visual forms. In such tasks no difference in ability was found between endogenous and exogenous groups.

Is this abnormal behavior only present in the visual-motor field or are there similar disturbances in other sensory fields? An attempt has been made to analyze auditory-motor performance.[14] In this test the children were requested to sing a melodic pattern presented to them on the piano. The performances of our exogenous and endogenous children were compared with previous results concerning the reaction of normal children to this test.[1, 15] Here again the endogenous group made errors strikingly similar to those of normal children of the same mental age. The exogenous group

made errors of a type rarely seen among normal children. Their reproduction lacked melodic-harmonic synthesis, satisfactory endings, or were unrelated to the original pattern, etc.

From these investigations involving two entirely different sensory fields, we conclude that there exists an impairment of rather general nature in the exogenous child.

Head,[2] Goldstein,[4] and other neurologists have presented evidence indicating that the brain-injured organism is much more controlled by outside forces than the normal organism. His attention will be caught and riveted much more rigidly upon those stimuli in the sensory field which are quantitatively distinguished. This may lead to a paradoxical situation; such defective individuals may disregard significant objects because of their smallness in favor of the diffuse background because of its largeness.

In a second formboard small triangular units of holes formed a definitely structured *background*. Against the strong influence of this *background* the child has to copy different *foreground* patterns from the examiner's board. Here it could be definitely observed, that the endogenous children withstood these *background* forces and constructed according to the *foreground* pattern given. Exogenous children, in contrast to this, changed the *foreground* pattern by slipping into the *background* pattern. These exogenous children were helplessly drawn into the *background,* arranging the marbles in lines suggested by its structure.*

This peculiar behavior of the exogenous child was shown still more strikingly by a tachistoscopic experiment.

The test consisted of a series of pictures. These pictures were black and white line drawings of objects such as a hat, a bird, etc., which were embedded in clearly structured homogeneous backgrounds consisting of jagged and wavy lines, squares, crosses, etc. The child was asked, after a short exposure ($\frac{1}{5}$ sec.), to tell what he saw. The endogenous child predominantly saw the object, mostly without mentioning the background. The exogenous children saw mostly only the background, describing it either vaguely or definitely.

* Detailed report and illustrations in: H. Werner and A. A. Strauss, Pathology of Figure-Background Relation in the Child. Accepted for publication in J. Abnorm. Soc. Psychol.

Before going on in the general discussion of our observations we may sum up the statistical results of the various tests.

DIFFERENTIAL RESPONSES OF TWO TYPES OF MENTAL DEFECTIVES IN FOUR TEST SITUATIONS.

Test.		No. of individuals.	Disorganized pattern, per cent.	Organized pattern, per cent.
I. Marbleboard I	Exog.	25	70	11
	Endog.	22	6	85
II. Auditory-motor	Exog.	26	61	39
	Endog.	22	11	88
			Background reaction, per cent.	Figure reaction, per cent.
III. Marbleboard II	Exog.	23	84	..
	Endog.	20	15	..
IV. Tachist	Exog.	25	76	11
	Endog.	25	14	58

The evidence gathered from these various tests points to a definite sensori-motor syndrome characterizing the brain-injured mentally defective child.

Sensori-motor activity, however, is only one aspect of mental organization. There is evidence that the brain-injured mentally defective child shows similar peculiarities in verbal intellectual functions.

These verbal intellectual functions of the exogenous children were analyzed, first, by comparing their answers given in the Stanford Binet test with answers of endogenous children of the same mental ages. Although the investigation is still not completed there are definite indications of a qualitative difference.

In many instances these exogenous children impress us by their verbosity, the fluency of speech, the peculiar use of unusual words and an affected style. For example, in defining "what is a balloon?", one child answered: "it goes up to the stratosphere." In response to the question as to what the child learned from the fable of the fox and the crow, (in which the fox lured the crow into dropping a piece of meat which she held in her beak by flattering her voice) a child of this type (M. A. 9.5 years, I. Q. 63) answered: "the crow didn't have a sweet tone, the fox just said it to fool her."

Answers of these exogenous children too, are sometimes queer, irrelevant and dyslogical. In detecting absurdities (Stanford Binet year X) for example, the sentence is given: "A man said—'I know a road from my house to the city which is downhill all the way to the city and downhill all the way back home.'" One exogenous child answered: "the man wasn't talking to anyone." Another answered: "Most anyone would know the road." A striking example that the selection of characteristics in the definition of objects deviates from the kind of selection made by individuals of other types of feeblemindedness may be illustrated by the answers of exogenous children to the question, "What is a balloon?". The answer "goes up in the air" or "filled with air" occurred in 27.5 per cent of the answers given by normal children, in 24.5 per cent of those given by endogenous children, but in 58 per cent of those given by exogenous children.

On the basis of these preliminary results a reasoning test has been devised including definitions, verbal absurdities, a verbal completion test, and a picture completion test. The results of this test so far yield further confirmation of the difference between the exogenous and endogenous child on the verbal intellectual plane.

Finally, there are personality characteristics of the brain-injured child. The results of recent psychiatric studies by Hohmann,[3] Kasanin,[5] Schroeder [8] and others point to a specific so-called "organic" behavior in these children. Strauss and Kephart presented last year at the annual meeting of this association a paper dealing with the behavior differences of these two groups, measured by a new behavior rating scale.[12] The scale shows the exogenous group to be erratic, uncoordinated, uncontrolled, disinhibited and socially unaccepted. The study suggests that behavior problems occurring in endogenous retarded children are completely apart from the commonly accepted picture of organic behavior.

On the basis of these observed differences—and it is highly probable that further investigations will confirm and extend our findings—it is concluded that the exogenous mentally defective children deviate in a number of important aspects of mental organization from the great mass of other types of feebleminded children.

To distinguish this organic syndrome of mental deficiency from the mine-run of feeblemindedness we suggest to characterize

these exogenous children as mentally crippled. This term may also imply that these children are damaged in the mental sphere during development in a similar way as the crippled children in the physical.

What do these findings mean for the problem of educating the exogenous child? We have already demonstrated that in an institution with an educational environment most favorable for the total class of the feebleminded child the exogenous child does not respond satisfactorily. We can now interpret, at least partially, such an educational failure.

Children with a definite lack of sensori-motor organization will lag behind the other children in any work which demands the coordination of motor and sensory functions, particularly in certain vocational activities. Because of specific intellectual impairment academic achievement will be more or less impeded. Because of a particular behavior deviation difficulties in group adjustment may arise.

Have we, then, to be contented with the little educational improvement the children might gain, or to be resigned to permitting the children to deteriorate? Or can we hope to offer this defective organism educational means more adequate for overcoming his difficulty?

Nine years experience with the training of mentally crippled children has demonstrated that through the use of special methods and special material there is often a much better educational prognosis than is ordinarily supposed.[10] Time does not permit a description of the special means used in vocational and academic training or in the educational and medical treatment of the behavior disturbance.

As a demonstration of the effectiveness of such methods, we may refer to one imbecile boy, now sixteen years old, trained for the past eighteen months as a test case in the Wayne County Training School. This boy had suffered in early infancy from an inflammatory disease of the brain. In the last four years before special training was started, a gain of only eight months of mental age had been achieved. As a result of one hour of academic training daily and a specially devised general program in the group, this boy gained 14 months in mental age during the next 18 months

period. This case was particularly chosen because of the unfavorable prognosis given him by the psychiatrist. Most significant is the fact that the speed of mental growth in this boy during the experimental period surpassed the average for the children in the institution.[7]

The mentally crippled child presents to the child neuropsychiatrist a problem analogous to that of the brain-injured adult. Research furthering the knowledge of the mentally crippled child is greatly needed for the improvement of our diagnostic methods, our understanding of the relation between the brain-injured adult and the mentally crippled child, and especially for the devising of necessary and adequate training methods.

BIBLIOGRAPHY.

1. Brehmer, Fritz: Die melodische Begabung des Kindes. Zschr. angew. Psychol., 1925, Suppl. 36.
2. Head, Henry: Studies in neurology. London, 1920.
3. Hohmann, L. B.: Postencephalitic behavior disorders in children. Johns Hopkins Hospital Bull., 33: 372, 1922.
4. Goldstein, Kurt: The organism. American Book Company, New York, 1939.
5. Kasanin, J.: Personality changes in children following cerebral trauma. J. Nerv. Ment. Dis., 69: 385, 1929.
6. Kephart, N. C., and Strauss, A. A.: A clinical factor influencing variations in I.Q. Am. J. Orthopsych., 10: 343, 1940.
7. Martinson, B., and Strauss, A. A.: The education and treatment of an imbecile boy of the exogenous type. To be published. Am. J. Mental Deficiency, 1940.
8. Schroeder, P. L.: Behavior difficulties in children associated with the results of birth trauma. J. Amer. Med. Assoc., 92: 110, 1929.
9. Strauss, A. A.: Typology in mental deficiency. Proc. Amer. Ass'n Mental Def., 44: 85, 1939.
10. Strauss, A. A.: Pedagogia terepéutica. Barcelona, 1936.
11. Strauss, A. A., and Kephart, N. C.: Rate of mental growth in a constant environment among higher grade moron and borderline children. Proc. Amer. Assoc. Mental Def., 44: 137, 1939.
12. Strauss, A. A., and Kephart, N. C.: Behavior differences in mentally retarded children measured by a new behavior rating scale. Am. J. Psychiat., 96: 1117, 1940.
13. Werner, H., and Strauss, A. A.: Types of visuo-motor activity in their relation to low and high performance ages. Proc. Am. Assoc., Mental Def., 44: 163, 1939.

14. Werner, H.: Auditory-motor organization in two clinical types of mentally deficient children. To be published. J. Genet. Psychol., 1940.
15. Werner, H: Comparative developmental psychology. Harper and Brothers, New York, 1940.

DISCUSSION.

DR. LAUREN H. SMITH (Philadelphia).—It would seem that the exogenous type, in reception and response to training, is somewhat blocked, that the experiences of life are not received well in comparison with the endogenous type. This is similar to our experience with the post-encephalitic children.

I would like to ask a question pertaining to the experience of the authors in the training programs. Is it not true that through separation of endogenous from exogenous cases better results for the former would be accomplished?

DR. LOUIS H. GOLD (Hartford, Conn.).—I should like to ask if the tests that Dr. Strauss devised showed any correlation with any of the tests of Goldstein and Gelb.

DR. SAMUEL BECK (Chicago, Ill).—An interesting question may be raised with reference to the Rorschach test and its possibilities of differentiating in these two groups of feebleminded children.

DR. LEO KANNER (Baltimore, Md.).—It has been refreshing to note in recent years the efforts made in various centers to get away from too generalized a consideration of feebleminded persons. Psychometric tests have made possible a quantitative gradation of intellectual inadequacy. But the idiots, imbeciles and morons were still dealt with in the main as if they were homogeneous groups with identical or very similar group characteristics. Feeblemindedness was, and often still is, spoken of in a fashion reminiscent of the undifferentiated use of the terms lunacy and insanity in the olden days.

In the last two decades, quantitative evaluation has been extended to the degree of social maturation of feebleminded children. Psychologists and sociologists alike have begun to pay attention to factors expressed in terms of communal adjustment values, stability, type of occupational usefulness intramurally or in free circulation. Psychiatrists have begun to interest themselves in studies of individual performances as well as smaller or larger groups presenting distinguishable features.

The paper by Drs. Strauss and Werner is a further valuable contribution in the direction of breaking down the erroneous conception of the feebleminded of any I.Q. range as a homogeneous mass to be dealt with in generalities. One may perhaps at first thought wonder about the three criteria upon which the diagnosis of exogenous type of mental deficiency has been based. On the other hand, the sensori-motor and verbal intellectual differences obtained by the authors and the personality differences described by others are so marked that a selection on the grounds of those criteria is justified by

the results of the reported investigations. I believe that this study is definitely a solid first step towards the separation of a group of retarded children who, be they referred to as mentally crippled or by any other name, deserve specialized attention from a highly practical point of view. Those who, as this discussant, are conversant with the caution and great reliability of the work of Drs. Strauss and Werner, will be gratified to have offered to them a workable series of differentiating tests. Beyond this, there certainly is a crying need for greater individualization in the study of the feebleminded, and the paper under discussion goes a long way towards supplying this need.

It would be helpful to know what the authors consider as "evidence of brain lesions" in 20-25 per cent of the children examined. It would also be of interest to know whether electroencephalographic investigations have been carried out and, if so, whether the group of mentally crippled children shows any departure from the rest of the retarded children considered in the study.

DR. ALFRED A. STRAUSS (Northville, Mich.).—We are very grateful for the comments the discussors gave to our paper.

We did not use the electro-encephalographic method as the necessary equipment was not available, but I believe that electro-encephalographic studies would be very useful. The percentage of organic or exogenous cases goes from 15 per cent in the borderline to 40 per cent in idiots.

As far as the psychological diagnosis is concerned, we have not made the Rorschach tests. Eight or nine years ago we tried to use the Rorschach test. At that time we did not succeed. I think the Rorschach has developed so far now that we should try again to use it.

There was a question about the Goldstein psychological test. In the course of our experience with it we were led to develop for these exogenous children tests with which we hoped to reach further than the Goldstein tests.

We are convinced that, in the work of training, isolation of the exogenous children is necessary.

THE INTERNAL ENVIRONMENT AND BEHAVIOR.

Part II. The Influence of Variations in the Blood Sugar on the Functions of the Brain.

By E. GELLHORN.*

The number of investigations dealing with the effects of hypoglycemia on mental activities is small but on the basis of experiments of Wiedeking [42] and Orenstein and Schilder [39] (*cf.* also Himwich and collaborators [24]), it may be said that the more complex functions such as associations and memory suffer first. Experiments involving simple mental tests show that the time required for their performance and the number of errors increases. Disturbances in sensations and perceptions are frequently observed leading to macropsy or micropsy and paresthesias affecting various senses (Benedek [2]). Although sensory threshold determinations have not been made, the description of the observations on patients and experimental subjects in hypoglycemia leaves no doubt that the threshold is greatly raised. These observations seem to indicate that hypoglycemia leads most markedly to disturbances at the cortical level. Furthermore, alterations in mood occur which may be interpreted as a disturbance in the relationship between the cortex (the frontal lobe in particular) and the hypothalamus. The results are, in general, similar to those found under oxygen want. (McFarland,[36, 37] Gellhorn.[12]) Objectively this similarity is brought out by studies on the electroencephalogram which show that in both cases, the alpha waves become less frequent and slower waves with larger potentials (delta waves) appear. (Gibbs, Davis and Lennox [23]; Lindsley and Rubenstein [34]; Hoagland, Cameron and Rubin.[27, 29])

Biochemical investigations have shown that hypoglycemia is accompanied by a decrease in oxygen utilization (Dameshek and Myerson [5]) and recent observations of Himwich and collaborators [25] show that with falling blood sugar the frequency of the

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alpha waves and the utilization of oxygen decrease while the delta-index increases.

These changes are not specific for insulin but rather are characteristic of hypoglycemia, as shown by Maddock's [35] experiments which showed that similar electroencephalographic changes result from hypoglycemia due to extirpation of the liver as are observed after injection of insulin. All changes are reversible on restoration of the blood sugar, either by glucose or in the case of the animal experiments by mannose or maltose.

Effects of hypoglycemia on the subcortical centers are not so well understood except that these centers have been found to be far more stable than the cortex itself. (Hoagland, Himwich, Campbell, Fazekas and Hadidian.[28]) This is evident also from Moruzzi's [39] experiments for he found that insulin convulsions occurred at a time when the cortical potentials had completely disappeared. These experiments indicate that the cortex is more susceptible to hypoglycemia than the subcortical structures, an observation which recalls the similar effects of oxygen deficiency on the brain. (Gellhorn and Spiesman [21]; Gellhorn and Storm.[22])

The similarity is easily understandable since the respiratory quotient of the brain is almost unity. (Himwich and Nahum [26]; Dickens and Simer.[7]) The diminution of the oxygen supply as well as the diminution of the sugar leads to a decrease of oxidative processes in the brain. This effect is more severe on the cortex than it is on the hypothalamus and medulla.

In view of the fact that the site of disturbance in clinical cases in which insulin hypoglycemia is administered is thought to be the autonomic centers (Hoskins and Jellinek [30]; Pfister [41]; Gellhorn [18] Singer [42] Lemere [33] and others), a study of their reaction to hypoglycemia seemed advisable.

The similarity between the effects of oxygen want and hypoglycemia on nerve structures made it possible to use oxygen want as a reagent to magnify the effects of hypoglycemia on vegetative centers. One series of experiments was carried out in narcotized dogs in which the blood pressure reaction to oxygen deficiency was determined at various blood sugar levels. It was found that oxygen tensions which at a normal blood sugar level produced only a very slight rise of blood pressure due to stimulation of the

chemoreceptors (Gellhorn and Lambert [10]) called forth a greatly increased pressure response when the blood sugar had fallen below 50 mg per cent. (Gellhorn, Ingraham and Moldavsky.[17]) The reaction was sometimes so great that the blood pressure was doubled during the inhalation of the gas deficient in oxygen. When glucose was injected and the blood sugar restored to the original level, the small blood pressure response found prior to the injection of insulin was observed again. Fructose was less effective than glucose in

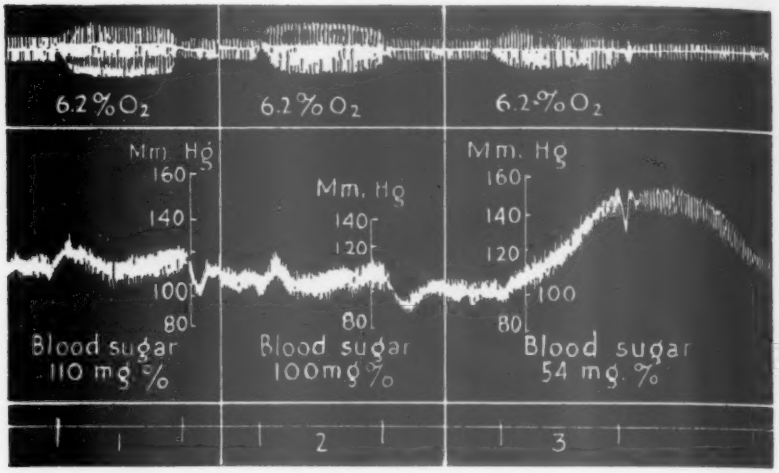

FIG. 1.—From above downward: (1) respiration, (2) blood pressure, (3) period of 6.2 per cent oxygen inhalation (3 min.). Sodium amytal 65 mg. per kilo intraperitoneally. 8 units of insulin per kilo intravenously injected between record 2 and 3. The record shows an enormous increase in the blood pressure response to 6.2 per cent O_2 when the blood sugar fell to 54 mg. per cent.

restoring the original condition and galactose had no restorative effect. These results indicate that in hypoglycemia, the sympathetic medullary centers are in a state of heightened excitability. They react, therefore, to the stimuli originating in the chemoreceptors when oxygen want is introduced with a greater blood pressure response than under control conditions. The reaction is not due to a discharge of adrenalin since the same effect is obtained after these glands have been eliminated. (Ingraham and Gellhorn.[81]) It may be mentioned that similar effects have been obtained in psychotic patients under conditions of insulin hypoglycemia. (Kraines and Gellhorn.[82])

The interaction of hypoglycemia and anoxia was studied also by means of the Cushing experiment. Cushing [4] had found that when the intracranial pressure is raised to the blood pressure level, the blood pressure rises above this level and this reaction persists during the period in which the intracranial pressure remains elevated. This reaction is due to an asphyctic stimulation of the vasomotor center in the medulla oblongata. (Eyster, Burrows, and Essick [9]; Yesinick and Gellhorn.[44]) We then studied how this reaction was modified quantitively when insulin hypoglycemia was produced. It was found that the blood pressure reaction to increased intracranial pressure increased during hypoglycemia and that this reaction was not abolished by the elimination of the chemoreceptors (Fig. 2).

In a third series of experiments, the action of anoxia in raising the blood sugar was studied in fasting rabbits at normal blood sugar level and during the early phase of insulin hypoglycemia. It was found that if rabbits inhaled 7 per cent oxygen for 15 minutes, their blood sugar rises due to secretion of adrenalin during this time but returns to the original level within 15 or 30 minutes. If, however, anoxia is administered for such a period in an animal made hypoglycemic by insulin, the blood sugar raising effect of adrenalin is more pronounced and lasts for a considerable period of time. (Gellhorn and Packer.[20])

These experiments show not only the effects of anoxia and hypoglycemia on the brain which is due to the fact that both procedures diminish its oxidative metabolism but they seem to indicate that at a time when the cortical activity is diminished or abolished (Moruzzi [39]), the autonomic centers are in a state of increased excitability. This is borne out by two further series of experiments. The first one is analogous to the study on the effects of oxygen lack on blood pressure described above, the difference being that now CO_2 was employed instead of gas mixtures low in oxygen. The blood pressure reaction to CO_2 was studied at various blood sugar levels (Gellhorn, Hamilton and Kiely [16]). Here again, it was found that the sensitivity of the vasomotor center increased with falling blood sugar, as shown by the fact that a given CO_2 concentration raises the blood-pressure more during hypoglycemia than at a normal blood sugar level. Since it is known that CO_2 acts both on the chemoreceptors in the carotid sinuses and the arch

FIG. 2.—Upper curve: blood pressure from the carotid artery. Lower curve intracranial pressure. Artificial respiration throughout the whole experiment. Sodium amytal 55 mg. per kilo intraperitoneally. The curve shows that with falling blood sugar, the effect of increased intracranial pressure on the blood pressure increases and that the effect is reversible on injection of glucose.

of the aorta and on the medullary center itself, it is important to state that the reported increase of the CO_2 effect on the blood pressure which occurs during hypoglycemia persists after the buffer nerves have been eliminated.

It is well known that stimulation of the sympathetic centers in the hypothalamus and in the medulla oblongata increases respiration in addition to eliciting the well known sympathetic responses. Anoxia likewise produces increased respiration and consequently a fall in the CO_2-tension of the alveolar air is due to the reflex stimulation of the respiratory center via the chemoreceptors.

In view of the similarity of the effects of anoxia and hypoglycemia on the central nervous system, it was of interest to

TABLE I.

CARBON DIOXIDE TENSION IN ALVEOLAR AIR AND SUGAR CONTENT OF THE BLOOD IN SCHIZOPHRENIC PATIENTS DURING INSULIN TREATMENT.

No. of experiment.	Tension in carbon dioxide alveolar air, percentage.	Blood sugar, Mg. per 100 cc.
19	3.85	110.5
	3.48	44.1
	3.52	46.0
After sucrose	4.44	117.0
21	4.58	115.0
	4.19	47.5
After sucrose	5.07	109.0

investigate whether respiration may not be altered in a similar way under conditions of hypoglycemia. If it could be ascertained that hypoglycemia is accompanied by a decrease in the CO_2-tension of the arterial blood and the alveolar air, and if it could be shown that this effect is reversible upon administration of glucose, we would have not only a further indication of the close relationship existing between anoxia and hypoglycemia but also new evidence showing increased sympathetic activity during the hypoglycemic state. Our experiments carried out on psychotic patients treated with insulin showed that when the blood sugar had fallen below a critical value, the CO_2-tension of the alveolar air decreased. (Domm and Gellhorn.[8]) On administration of sucrose by stomach tube the effect was reversible. (Table I.) Similarly it was found in narcotized and unanesthetized dogs that with falling blood sugar,

the CO_2-tension of the arterial blood decreased. This effect was also reversible on injection of glucose. We find that insulin hypoglycemia produces an increased respiration leading to a decrease in the CO_2-tension of the alveolar air and of the arterial blood which is similar to the increased respiration observed on hypothalamic stimulation together with other signs of sympathetico-adrenal discharge. If, however, in the human the hypoglycemia is continued until coma occurs, it is found that in this condition the CO_2-tension in the alveolar air rises distinctly.

The significance of the increased excitability and tone of the sympathetico-adrenal system in insulin hypoglycemia is best understood in the light of Cannon's [3] theory of homeostasis. The increased liberation of adrenalin from the adrenal glands leads to a quicker restoration of the blood sugar and a return to normal excitability of the brain, provided that the amount of insulin administered was not too large. It is interesting to note that adrenalin which by its action on the blood sugar is responsible for the return of normal physiological conditions, has in addition to this effect a damping influence on medullary and hypothalamic sympathetic centers. This is seen by the fact that the blood pressure response and contraction of the nictitating membrane in response to an afferent stimulus is decreased on injection of small amounts of adrenalin (Fig. 3). (Darrow and Gellhorn.[6]) Moreover it was found that a typical sympathetic response resulting from hypothalamic stimulation by means of faradic currents, namely the contraction of the nictitating membrane is greatly reduced on intravenous administration of adrenalin (Fig. 4). (Gellhorn, Carlson and Darrow.[14]) The physiological significance of this phenomenon is obvious. Apparently adrenalin secreted from the adrenal glands following increased sympathetic excitability restores not only the blood sugar which may have been lowered by insulin but reduces also the excitability of the hyperexcitable sympathetic centers towards normality and contributes thereby to homeostasis.

How closely physiological and pathological conditions are related is seen from a study of insulin hypoglycemia and of the effects of adrenalin in conditions which at least temporarily lead to a breakdown of homeostatic relations. If an animal is subjected to insulin hypoglycemia and simultaneously to a prolonged anoxia

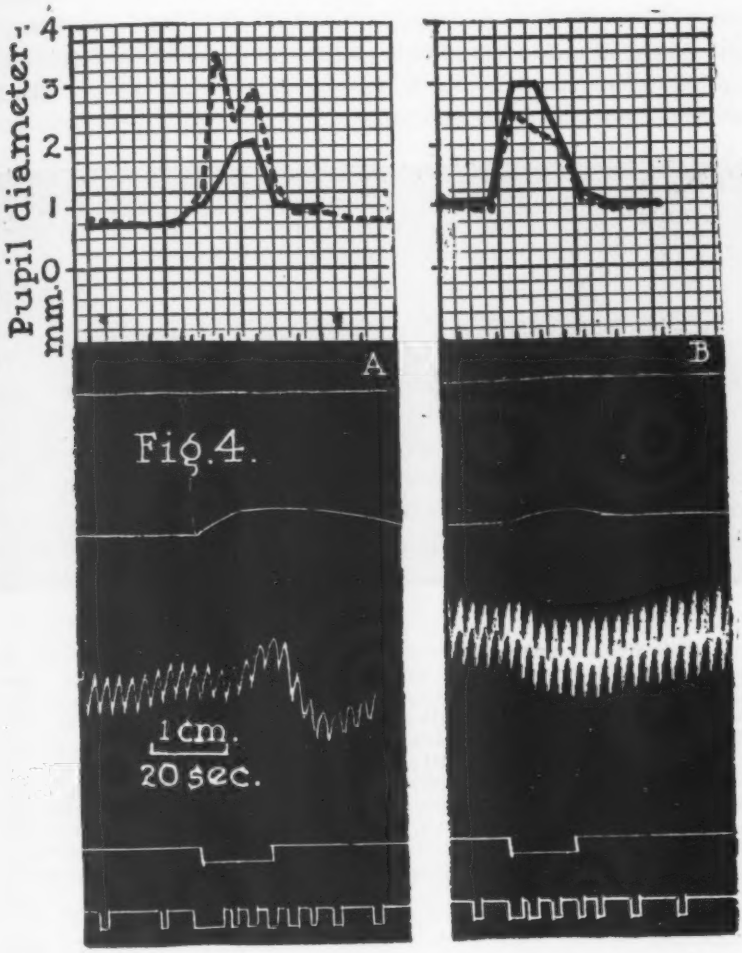

FIG. 3.—Influence of adrenalin on the reflex excitability of the autonomic system. The effect of stimulation of the brachial plexus (coil at 5 cm. for 15 sec.) before (fig. 1a) and after (1b) perfusion with adrenalin 1 : 200,000 3 cc/min. for 3 min. – – – –: normal pupil; ———: sympathectomized pupil. Kymograph record from above downward: sympathectomized nictitating membrane (N. M.) normal N. M., blood pressure, signal indicating stimulation of brachial plexus and signal signifying time when photographs of the pupils were taken.

of several hours, it is found that under these conditions the blood sugar falls very low. (McQuarrie and Ziegler.[38]) We confirmed this observation for the rabbit and found that the average blood sugar in nine experiments in which the animals were given 2.5 units of insulin per kilo subcutaneously was 40 mg per cent three

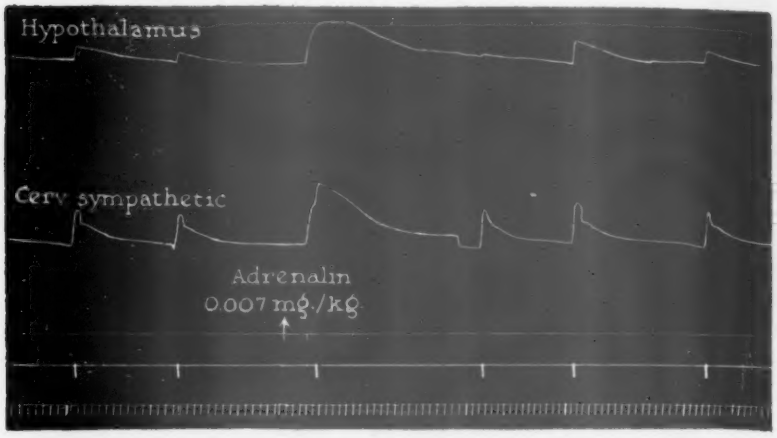

FIG. 4.—Contractions of the nictitating membrane resulting from stimulation of the hypothalamus (upper curve) and from the cephalad end of the cervical sympathetic in the cat narcotized with 100 mg. chloralosane subcutaneously. Stimulated with Harvard inductorium in 1 minute intervals for 3 seconds. Time: five second intervals. On injection of adrenalin, both nictitating membrane contract but whereas the stimulation of the cervical sympathetic results in an additional contraction, no such contraction is observed on hypothalamic stimulation. One minute later, the hypothalamic stimulation fails again to elicit the contraction whereas peripheral stimulation produces a typical contraction. After another minute, however, the central stimulation causes an effect similar to that observed prior to the injection of adrenalin. The experiment shows that adrenalin inhibits temporarily hypothalamic excitability.

hours after the injection whereas the same animals injected with an equal amount of insulin showed a blood sugar of only 27 mg per cent three hours after the injection when they inhaled 7 per cent oxygen during the last two hours. This aggravation of the hypoglycemia in the anoxic animals is due to the fact that prolonged anoxia prevents adrenalin from liberating glucose in the liver. (Gellhorn and Packer.[20]) Under these circumstances an alteration in nervous excitability is apparent. In spite of extreme degrees of hypoglycemia, the animals did not show hypoglycemic convulsions. (McQuarrie and Ziegler [38]; Gellhorn and Packer.[20])

Another condition of breakdown of homeostasis may be briefly mentioned. Unanesthetized dogs with adrenalin injected subcutaneously so that it is absorbed continuously for several hours, show signs of general hyperexcitability. Analyses of the arterial blood by heart puncture reveal that the blood sugar is elevated and the CO_2-tension of the arterial blood is decreased. (Domm and Gellhorn [8] (Table 2).) Apparently unphysiological quantities of adrenalin acting on the central nervous system over prolonged periods of time may lead to increased excitability of sympathetic and somatic centers. It is this condition which prevents the blood from returning to its original composition.

TABLE II.

INFLUENCE OF ADRENALIN ON CO_2-TENSION AND BLOOD SUGAR OF THE ARTERIAL BLOOD IN UNANESTHETIZED DOGS.

Dog, 14.8 kg.

10:20 a. m. Blood sugar 76.5 mg. per cent; $CO_2 = 41.6$ mm.; ph. $= 7.32$.
11:05 a. m. Adrenalin hydrochlor. 1:1000 0.05 cc./kg. subcutaneously.
11:30 a. m. Blood sugar 78.7 mg. per cent; $CO_2 = 36.4$ mm.; ph. $= 7.35$.
12:52 p. m. Blood sugar 99.8 mg. per cent; $CO_2 = 28.0$ mm.; ph. $= 7.29$.
2:10 p. m. Blood sugar 87.3 mg. per cent; $CO_2 = 36.7$ mm.; ph. $= 7.34$. Quiet resting.
3:25 p. m. Blood sugar 76.5 mg. per cent; $CO_2 = 40.5$ mm.; ph. $= 7.33$.

In relating these experiments to the theory of homeostasis the following interpretation and summary may be made:

Insulin hypoglycemia leads to a hyperexcitability of sympathetic centers and consequently to an increased secretion of adrenalin. This tends to restore not only the blood sugar level but also, by reflex action on the carotid sinus (Gellhorn, Darrow and Yesinick [15]), the excitability of the sympathetic centers. If, however, larger quantities of adrenalin are injected, it may lead to a general increase in hyperexcitability and hyperglycemia. In this condition the adrenalin, by means of its action on the central nervous system, seems to be responsible for the generally increased excitability since a hyperglycemia of a similar degree produced by sugar injections does not alter autonomic excitability. (Gellhorn, Ingraham and Moldavsky.[17])

The combination of anoxia and hypoglycemia for a sufficiently long period of time leads also to a breakdown of homeostatic regulations. In this condition, we find extreme hypoglycemia associated with a failure of the brain to react to the low blood sugar with hypoglycemic convulsions. From these data, it may be concluded that the temporary alteration of the blood sugar produced by insulin hypoglycemia evokes mechanisms, *i. e.*, the secretion of adrenalin, which restore both the sugar level of the blood and the original nervous excitability. If, however, adrenalin is applied in greater quantities or for longer durations, it leads to an increased excitation of sympathetic centers which are no longer amenable to homeostatic regulations. Only after the absorption of adrenalin has ceased, original conditions in blood sugar level and general excitability are restored. A similar breakdown of homeostatic relations may be considered the condition resulting from hypoglycemia and prolonged anoxia. Here too an altered excitability of the brain is evident. These observations contribute not only to Cannon's [3] theory of homeostasis but lend support to an idea first expressed by Barcroft [1] that the significance of the homeostatic regulations is a preservation of the function of the brain in general and of the cortex in particular.

SUMMARY.

1. Hypoglycemia leads to a general decrease in cortical activity, measurable by a delay in and an inaccuracy of mental functions. This condition is accompanied by typical changes in the electroencephalogram and in the electrocorticogram which indicate a diminution in the oxidative state of the cortex (Hoagland).

2. Insulin hypoglycemia produces a state of increased excitability of sympathetic centers. This is shown by an increased blood pressure response to anoxia and to CO_2 at low blood sugar levels. It is further indicated by the increased blood pressure rise on raised intracranial pressure during the hypoglycemic state. Since the increased response to CO_2 and to increased intracranial pressure persists after elimination of the chemoreceptors of the carotid sinus area and of the arch of the aorta, it follows that low blood sugar increases sympathetic responses not only in response to reflex stimuli but also to stimuli acting directly on the

centers. Another indication of increased excitability of the sympathetico-adrenal system in hypoglycemia is the fact that the blood sugar rise observed during a brief period of anoxia is more marked in the hypoglycemic animal than it is at a normal blood sugar level.

3. This increased sympathetic excitability is linked up with a sympathetico-adrenal discharge occurring during hypoglycemia. To the well known signs of such a discharge is added the fact that the CO_2-tension of the arterial blood and of the alveolar air decreases in hypoglycemia. If, however, coma supervenes, the CO_2-tension in the alveolar air rises. This may be taken as an indication of a generally decreased excitability of the brain.

4. The increased sympathetico-adrenal discharge occurring in insulin hypoglycemia tends to lead to a restoration of normal conditions (homeostatis) not only by the glycogenolytic action of adrenalin on the liver but also by its depressing action on the sympathetic centers via the carotid sinus.

5. If hypoglycemia and anoxia are combined for several hours, a condition results in which homeostatic regulations break down by the failure of adrenalin to produce glycogenolysis. Under these conditions the excitability of the brain is altered since the animals do not respond with convulsions to extreme degrees of hypoglycemia.

6. The excitability of the autonomic system is not altered by an increased blood sugar level resulting from the injection of glucose. However, a rise of blood sugar resulting from reflex stimulation of autonomic centers by painful stimuli or by injection of metrazol or adrenalin is accompanied by a generally increased excitability and a fall in the CO_2-tensions of the arterial blood.

BIBLIOGRAPHY.

1. Barcroft, J.: Features in the architecture of physiological function. New York, 1934.
2. Benedek, L.: Insulin-Shock-Wirkung auf die Wahrnehmung. Berlin, 1935.
3. Cannon, W. B.: The wisdom of the body. New York, 1939.
4. Cushing, H.: Concerning a definite regulation mechanism of the vasomotor centre which controls blood pressure during cerebral compression. Johns Hopkins Hosp. Bull., 12: 290, 1901.

5. Dameshek, W., and Myerson, A.: Insulin hypoglycemia: The mechanism of neurologic symptoms. Arch. Neurol. Psychiat., Chicago, 33: 1, 1935.
6. Darrow, C. W., and Gellhorn, E.: The effects of adrenalin on the reflex excitability of the autonomic nervous system. Am. J. Physiol., 127: 243, 1939.
7. Dickens, F., and Simer, F.: The metabolism of normal and tumor tissue: IV. The respiratory quotient in bicarbonate media. Biochem. J., 25: 985, 1931.
8. Domm, S., and Gellhorn, E.: Unpublished observations.
9. Eyster, J., Burrows, M. T., and Essick, C. R.: Studies on intracranial pressure. J. Exp. Med., 11: 489, 1909.
10. Frostig, J. P.: Experiences with the insulin therapy in schizophrenia with special reference to clinical problems. Am. J. Psychiat. (Suppl.), 94: 220, 1938.
11. Frostig, J. P.: Sakel's pharmacologic shock treatment for schizophrenia. Arch. Neurol. Psychiat., 39: 219, 1938.
12. Gellhorn, E.: The integrated action of the organism exemplified by studies on anoxemia. Sigma Xi Quarterly, 25: 156, 1937.
13. Gellhorn, E.: Effects of hypoglycemia on the central nervous system. Arch. Neurol. Psychiat., 40: 125, 1938.
14. Gellhorn, E., Carlson, H., and Darrow, C.: Unpublished observations.
15. Gellhorn, E., Darrow, C. W., and Yesinick, L.: Effects of epinephrine on convulsions. Arch. Neurol. Psychiat., 42: 826, 1939.
16. Gellhorn, E., Hamilton, S. L., and Kiely, W. F.: Unpublished observations.
17. Gellhorn, E., Ingraham, R. C., and Moldavsky, L.: The influence of hypoglycemia on the sensitivity of the central nervous system to oxygen want. J. Neurophysiol., 1: 301, 1938.
18. Gellhorn, E., and Lambert, E. H.: The vasomotor system in anoxia and asphyxia. University of Illinois Press, Urbana, Ill., 1939.
19. Gellhorn, E., and Packer, A. C.: Influence of anoxia on glycogenolytic action of adrenalin. Proc. Soc. Exp. Biol., N. Y., 41: 345, 1939.
20. Gellhorn, E., and Packer, A. C.: Unpublished observations.
21. Gellhorn, E., and Spiesman, I.: The influence of hyperpnea and of variations in the O_2- and CO_2-tension in the inspired air upon nystagmus. Am. J. Physiol., 112: 662, 1935.
22. Gellhorn, E., and Storm, L. F. M.: The influence of hyperventilation and of variations of oxygen and carbon dioxide tension in the inspired air upon galvanic nystagmus. Acta oto-laryng., Stockh., 26: 387, 1938.
23. Gibbs, F. A., Davis, H., and Lennox, W. G.: Electroencephalogram in epilepsy and in conditions of impaired consciousness. Arch. Neurol. Psychiat., Chicago, 34: 1133, 1935.
24. Himwich, H. E., Frostig, J. P., Fazekas, J. F., and Hadidian, Z.: The mechanism of the symptoms of insulin hypoglycemia. Am. J. Psychiat., 96: 371, 1939.

25. Himwich, H. E., Hadidian, Z., Fazekas, J. F., and Hoagland, H.: Cerebral metabolism and electrical activity during insulin hypoglycemia in man. Am. J. Physiol., 125: 578, 1939.

26. Himwich, H. E., and Nahum, L. H.: The respiratory quotient of the brain. Am. J. Physiol., 101: 446, 1932.

27. Hoagland, H., Cameron, D. E., and Rubin, M. A.: The electroencephalogram of schizophrenics during insulin treatments. Am. J. Psychiat., 94: 183, 1937.

28. Hoagland, H., Himwich, H. E., Campbell, E., Fazekas, J. F., and Hadidian, Z.: Effects of hypoglycemia and pentobarbital sodium on electrical activity of cerebral cortex and hypothalamus (dogs). J. Neurophysiol., 2: 276, 1939.

29. Hoagland, H., Rubin, M. A., and Cameron, D. E.: The electroencephalogram of schizophrenics during insulin hypoglycemia and recovery. Am. J. Physiol., 120: 559, 1937.

30. Hoskins, R. G., and Jellinek, E. M.: The schizophrenic personality with special regard to psychologic and organic concomitants. Proc. of the Association for Research in Nervous and Mental Disease, 14: 211, 1933.

31. Ingraham, R. C., and Gellhorn, E.: Rôle of adrenals in blood pressure reaction to anoxia during insulin hypoglycemia. Proc. Soc. Exp. Biol., N. Y., 40: 315, 1939.

32. Kraines, S. H., and Gellhorn, E.: The effects of insulin hypoglycemia on the blood pressure response to oxygen deficiency in man. Am. J. Psychiat., 95: 1067, 1939.

33. Lemere, F.: A theory as to the physiopathology of the functional psychoses and neuroses. Medical Record, 150: 206, 1939.

34. Lindsley, D. B., and Rubenstein, B. B.: Relationship between brain potentials and some other physiological variables. Proc. Soc. Exp. Biol., N. Y., 35: 558, 1937.

35. Maddock, S., Hawkins, J. E., and Holmes, E.: The inadequacy of substances of the "glucose cycle" for maintenance of normal cortical potentials during hypoglycemia produced by hepatectomy with abdominal evisceration. Am. J. Physiol., 125: 551, 1939.

36. McFarland, R. A.: The effects of oxygen deprivation (high altitude) on the human organism. Dept. of Commerce, Bureau Air Commerce, Safety and Planning Division, Report No. 13, 1939.

37. McFarland, R. A.: The psychological effects of oxygen deprivation (anoxia) on human behavior. Arch. Psychology, No. 145, 1932.

38. McQuarrie, I., and Ziegler, M. R.: Mechanism of insulin convulsions. II. Effects of varying partial pressures of atmospheric O_2, N_2 and CO_2. Proc. Soc. Exp. Biol., N. Y., 39: 525, 1938.

39. Moruzzi, G.: Etude de l'activite electrique de l'écorce cérébrale dans l'hypoglycemie insulinique et dans differentes conditions modifiant le metabolisme des centres. Arch. Int. Physiol., 48: 45, 1938.

40. Orenstein, L. L., and Schilder, P.: Psychological considerations of the insulin treatment in schizophrenia. J. Nerv. and Ment. Dis., 88: 397, 1938.

41. Pfister, H. O.: Die neuro-vegetativen Storungen der Schizophrenien und ihre Beziehungen zue Insulin-Cardiazol-und Schlafkurbehandlung. Schweiz. Arch. Neurol. Psychiat. (Supp.), 39: 77, 1937.

42. Singer, H. D.: Psychosis and the central autonomic nervous system. J. A. M. A., 110: 2048, 1938.

43. Wiedeking, J.: Selbstbeobachtungen im hypoglykamischen Zustand. Z. ges. Neurol. Psychiat., 159: 417, 1937.

44. Yesinick, L., and E. Gellhorn: Studies on increased intracranial pressure and its effect during anoxia and hypoglycemia. Am. J. Physiol., 128: 185, 1939.

PSYCHIATRIC FACILITIES IN VIRGINIA AND SOME NEIGHBORING STATES.

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In Virginia, as in most other states, the history of psychiatry revolves around the development of the state hospitals. Yet one must not forget that much stimulus to progress has also been derived from well-conducted private institutions for the mentally ill, lay organizations interested in social welfare, individual efforts and the press, which is always interested in the public welfare.

In this condensed review it seems proper also to comment briefly regarding these matters in some of our neighboring states to the south and along the Atlantic seaboard, viz., North Carolina, South Carolina and Georgia. It is fully recognized that there are other neighboring states which should be mentioned but are omitted in the interest of space.

The first state hospital in the United States for care of the insane was established at Williamsburg, Virginia, in 1773. It was officially known as the Publick Hospital for Persons of Insane and Disordered Minds. Amongst the townspeople it was known as the madhouse and in the library of the College of William and Mary, there is a map of Williamsburg, dated 1780, which designates the hospital as the Mad-House or Bedlam.

The hospital was controlled by a court of directors who also decided whether or not allegedly insane persons deserved to be admitted. Amongst the members of this court were several distinguished and historically famous men, viz., Thomas Nelson, Jr., a signer of the Declaration of Independence and later Governor of Virginia; Peyton Randolph, the first President of the Continental Congress, and George Wythe, a signer of the Declaration of Independence, and also the law teacher of both John Marshall and Thomas Jefferson.

According to *A Brief History of the Eastern State Hospital,* Williamsburg, Virginia, published by the Hospital, "The premises and appurtenances were given to the Court of Directors of the Publick Hospital for Persons of Insane and Disordered Minds and

their Successors forever, by Thomas Walker, in his will which was signed by him and his indenture was proved by the oaths of Henry Tazewell, John Jamieson and John Brown, witnesses, at a court held for James City County, December 10, 1770."

"A building was erected one hundred feet long by thirty two feet, two inches wide, with a front projection of three feet, six inches, two stories high. The plan was furnished by Robert Smith of Philadelphia and its date reads April 9, 1770. It consists of a hall for a staircase; behind there are the keeper's apartments and twelve other rooms, chiefly for the reception of mad people. The second story has twelve rooms of the same dimension as those in the first story, and a room over the keeper's apartment which serves the managers of the hospital to meet or may be divided which will make two other rooms for patients, etc.

"If there should be occasion for fire to warm the common rooms there may be stoves fixed in the partitions of the two rooms, with the mouth open to the passage by which they make fires and the mad people cannot come at them."

On Tuesday, the 14th of September, 1773, at a meeting of the Court of Directors, the president informed the court that the hospital was completed, whereupon the court proceeded to examine the said hospital, and finding it finished according to agreement, the same was received of Benjamin Powell, "the undertaker."

James Galt was appointed keeper and referred to the General Assembly for such salary as his services were thought to merit. Thus began the long connection of the Galt family with the hospital, which ended in the death of Dr. John Minson Galt in May 1862. It is interesting to note that for bringing a patient to the hospital, the sheriff received five pounds of tobacco per mile.

The hospital was also the first in the country to care for the colored insane. In 1774, Charity, a free mulatto woman, was admitted, and for seventy-two years thereafter only free negroes were admitted, but in 1846, in accordance with an Act of the legislature, slaves were also received.

The Publick Hospital was later known as the Eastern Lunatic Asylum and later still received its present name, Eastern State Hospital.

On January 8, 1876, fire destroyed the service section of the hospital and in June 1885, a disastrous fire destroyed the center

building with its wings and also a building known as the "White House." The center building was the original building completed September 14, 1773. All these buildings have been replaced by large, convenient and substantial structures, not connected but at convenient distances apart, giving the entire group an airy and attractive appearance. The hospital has continued to grow until now it has a net patient capacity of 1693 and a patient population of 1750.

The second hospital for the care of the state's insane was opened in Staunton in 1828, but it was no sooner opened than it was filled to capacity. Faced with a long waiting list, the hospital authorities found it necessary to restrict admissions to patients who were either dangerous or offensive to society, and to those whose prognosis seemed reasonably hopeful.

Dr. Francis T. Stribling, the first superintendent of this hospital, was amongst the "Original Thirteen" of this Association, as was Dr. John M. Galt, who was superintendent of the Eastern State Hospital in 1844.

It is a matter of pride to note that current conceptions as to treatment of the insane at that time did not control the officers or directors of the Western Lunatic Asylum of Virginia, and in their report for 1839 the directors say:

> Much useful information has already been diffused among the people on this subject, and it is to be hoped that the day is not far distant when insanity will no longer be regarded as a crime which should banish its unfortunate victims from the light of day and to consign them to ignominious imprisonment and chains, but as a misfortune which should entitle them to the strongest claims on the sympathy and humanity of their friends.
>
> It is equally important that the equally fallacious and mischievous idea that a lunatic asylum is an object of unmitigated horror and disgust in which clanking chains, straight jackets and frantic violence are the most prominent objects, should give place to a more correct and rational view of the subject.
>
> While these notions prevail it will be impossible to overcome the repugnance which the friends of the insane so naturally feel against placing them in our asylums. The directory would think that they had rendered an essential service by the publication of their physicians' report. From that report, as from former communications, it will be seen that everything like violence or coercion has been abandoned in the treatment of the insane at the Western Lunatic Asylum, and the mildest and most soothing and parental conduct has been substituted in its stead. They are encouraged to seek amusement in reading, in various games, and in such occupations as are congenial to their tastes and former pursuits. The directory are gradually perfecting their

system of moral treatment, which, when brought into complete operation, will afford useful and profitable employment to a large proportion of the inmates of the asylum.

Dr. Stribling, in his report, mentions the effect on the patients of the beauty of the site and surroundings of the institution, and of the clean comfortable building in which they live.

Describing the effect of treating patients as human beings and not wild beasts, he says:

About one-half, however, of the whole number of patients in the asylum are permitted to partake of their meals at the table, and though allowed the use of knives and forks, no effort has ever been made to abuse the privilege thus granted them.

It may not be irrelevant to relate a circumstance which occurred here about 18 months since. At the time the first effort was made in this institution to convene the inmates around the table, a number who had been previously apprised of the arrangement were introduced into the dining room, where everything was supposed to be in readiness for them to take their seats. Some of them had not seen a table spread with provisions for ten years. Most of them had been debarred this privilege for more than five years, hence, as might have been most reasonably expected, when they beheld their seats which they had been told were provided for their accommodation, there was considerable confusion exhibited in their attempt to occupy them. At this moment, however, a knock upon the table was heard and at its head stood "Lord Primate" displaying all the gravity and sanctity incident to the holy office of which he imagines himself the responsible incumbent. In a tone of authority he commanded "Order," and, as if by magic, everyone sprang to his feet and fixed his eyes intently on the speaker. In a mild and becoming manner he then reminded them of the relation in which they stood to that Supreme Being who had graciously provided for their use the provisions before them, and chided them for their rudeness in thus attempting to partake of them without first having supplicated a blessing from the same source. He then drew from his pocket a paper and read therefrom in a solemn and impressive manner a lengthy supplication (written by himself and it seemed for this occasion) to an audience of amazed though attentive listeners. It is needless to add that the sensibility of this "church dignity" has not since been shocked by a similar scene of disorder, and that the same ceremony has been regularly and (by some) devoutly observed ever since.

Dr. Stribling further described the various forms of occupation and recreation for the patients and from his reports it is quite evident that more than 100 years ago he had grasped the great principles of treatment of the mentally ill that are in universal use today.

On July 23, 1874, this institution sustained a heavy loss in the death of Dr. Stribling, who had served as superintendent since 1836. At a time when every institution in the south, and all but a very few in the remainder of the country, were little more than penitentiaries, he looked on the institution under his care as a hospital for the treatment of disease. His system of moral treatment was a distinct advance, and he was one who could minister to a mind diseased, not by drugging into a stupor, but by developing the better instincts by occupation and recreation. He introduced the system of parole, which is in universal use today. Without doubt Dr. Stribling is one of the men whom Virginia should delight to honor. In 1905 Dr. J. S. DeJarnette became superintendent and has just recently completed 50 years of service.

In the meantime the hospital has increased in capacity and now has a net bed capacity of 2388 with a population of 2431.

In 1859 a hospital was established at Weston, to be known as "The Lunatic Asylum West of the Alleghany Mountains." The first building, a one story structure, was occupied September 9, 1859, when nine patients were transferred thereto from Columbus, Ohio, where they had been maintained by the State of Virginia, pending the construction of the new asylum. In June 1861, the operations of the Civil War put an end to the further construction of buildings as far as the State of Virginia was concerned. The buildings were finally completed by the new State of West Virginia, and by the Act of the Legislature of West Virginia December 7, 1863, the name of the institution was changed to the "West Virginia Hospital for the Insane."

Shortly after the close of the War between the States, Richmond had been overrun by thousands of emancipated slaves, some of whom were mentally ill or defective, while others were physically unable to support themselves. The federal authorities found it necessary to do something and in 1869 established a temporary asylum at Howard Grove near Richmond. This institution also served as a poor house on a grand scale. It later became the Central Lunatic Asylum and in 1885 was moved to a location outside of Petersburg, Virginia. It was made a permanent institution and located at Petersburg by an Act of the legislature March 6, 1882. It is now the Central State Hospital, the first state hospital exclusively for the care of negroes.

Shortly after the removal of the institution to Petersburg, Dr. William F. Drewry, the 38th president of The American Psychiatric Association (1909-1910), became associated with it as assistant physician. In 1896 he became superintendent, succeeding Dr. Randolph Barksdale, and served in this capacity until 1924. He was succeeded by Dr. H. C. Henry, who served until 1938. It is to the efforts of these three physicians that the present Central State Hospital owes its development. The present net capacity is 3051 beds with an actual population of 3521.

During 1883 and 1884 the crowded condition of the asylums at Williamsburg and Staunton caused many of the insane of the state to be kept in jails and almshouses. On March 5, 1884, the legislature took steps to remedy this condition by creating a commission to select a site and erect a fourth asylum for the insane. Marion, in the southwestern part of the state, was chosen and the new institution was opened for the reception of patients February 12, 1887. It is now known as the Southwestern State Hospital.

Previous to 1906, under the law, the criminal insane had been kept in a special ward at the State Penitentiary. In this year the legislature repealed this statute and thereafter such offenders were transferred to the state hospitals. This did not prove satisfactory and in 1910 an Act of the legislature provided for a special department for the white criminal insane at the Southwestern State Hospital and one for the negro criminal insane at the Central State Hospital.

This institution, which now serves 18 counties in the southwestern part of the state and the entire state for the reception of the so-called "criminal insane," has a net bed capacity of 1344 with a patient population of 1256. (Annual report of the State Hospital Board, June 30, 1939.)

As early as 1893 the care of epileptics in Virginia came up for serious consideration. Many of these cases were already in the state hospitals. A duly authorized committee investigated the care of these individuals in other states, ascertained costs, etc., and made recommendations, but unfortunately the financial condition of the state made it advisable to do nothing further about the problem at that time.

Ten years later the issue came up for more positive consideration when a prominent citizen, whose son was an epileptic and

a patient in the Western State Hospital, bequeathed to the state a farm of 200 acres in Amherst County for the purpose of providing comforts for the patients of that hospital. The provisions of the will were, however, construed to permit the use of the property by the legislature in establishing a colony on it for the care and treatment of epileptics.

An appropriation of $25,000 was made and work started under the control of the Board of the Western State Hospital. It was then decided that the topography of the farm was unsuited to the needs of such an institution and it was recommended to the General Assembly that the property be sold and a more suitable site purchased. With an additional appropriation of $20,000 one thousand acres near the city of Lynchburg were purchased for $35,000. The General Assembly ratified the action and appropriated $80,000 additional to provide accommodation, plus operating costs, for 100 epileptics. On February 16, 1910, the General Assembly established a separate board and the Virginia State Epileptic Colony came into existence. The buildings were completed February 1, 1911, and the epileptics began to move in, thirty from the Southwestern State Hospital, thirty from the Eastern State Hospital and forty from the Western State Hospital. Thirty-five more came from almshouses and elsewhere, making a total of 135 patients during the first year.

In 1913 separate provisions were made for feebleminded women of child-bearing age. There were also established facilities for female epileptics. Thus was established the Virginia State Colony for Epileptics and Feebleminded.

In the same year the superintendent asked for an appropriation for the construction of a school building, which might also serve as a center for religious and social gatherings. It was planned to have special classes for "unreduced" epileptics and for feebleminded girls who were soon to become inmates of the Colony. This has not yet been granted but an active training program is being carried on under difficulties. This hospital is now known as the Lynchburg State Colony. It serves the entire state for its white feebleminded and epileptics and has a net bed capacity of 1368 with a patient population of 1395.

In 1914 an Act of the legislature provided for the establishment of a colony for negro feebleminded on the property of the Central

State Hospital but no appropriation was made for the purpose. A separate portion of the buildings of the Central State Hospital has continued to be used, however, for the care of colored feebleminded until by special Act of the legislature (1938) the Petersburg State Colony was established to take its place. This institution is new and undeveloped but it constitutes a long-needed facility for the colored feebleminded of the state.

DeJarnette State Sanitorium.

This institution, located a short distance from the Western State Hospital, was opened for reception of patients May 20, 1932. It is owned by the state, operated under a special act of the legislature and supervised and controlled by the superintendent of the Western State Hospital and the State Hospital Board. Only residents of Virginia are admitted, and they must pay the estimated actual cost of their care. This cost for the year ending June 30, 1939, was $2.643 per day.

Other institutional provisions for the care of the mentally ill are: Westbrook Sanatorium and the Tucker Sanatorium, both in Richmond, and St. Albans Sanatorium, Radford, Virginia. The Veterans Administration Facility at Roanoke is one of the Veteran Administration's many modern hospitals for the mentally ill.

The State Hospital Board.

Prior to 1903 each of the state institutions was managed by a Board of Directors composed of nine members appointed by the Governor. The Constitutional Convention of 1902 provided for a special board of three for each institution, and a general board, composed of all the special boards, to have general supervision of all the institutions; and furthermore, a Commissioner of State Hospitals, who was ex-officio chairman of each special and general board, and it was his duty to inspect the institutions monthly, countersign checks, look over the finances, etc. The commissioner, whose qualifications were not specified, did not have any duty or right to erect a statewide program of standards for the care and treatment of patients. The control and policies of each institution continued to rest with its special board as the extent of the authority of the general board was not well defined. The general board was,

however, dominated by a group who seemed to believe that the most important thing was to limit and decrease the amount of money spent for the care and treatment of the mentally ill. Under such a system the state hospital superintendents were compelled to compete with each other in conducting their institutions at small cost. Exceedingly low per capita costs were reached, but only through the elimination of many vital functions that every well-conducted hospital should perform.

In 1928 a reorganization bill grouped all state welfare institutions under the Department of Public Welfare and abolished the office of Commissioner of State Hospitals, his duties falling ex-officio on the Commissioner of Public Welfare. The special boards and the general board continued, however, to control the several institutions with the Department of Public Welfare exercising visitorial functions.

Probably the most advanced and far-reaching legislation of recent years in Virginia, relating to the care and treatment of the mentally ill, feebleminded and epileptics, was that passed by the 1936-7 session of the General Assembly. This legislation abolished the several special boards and the general board and created instead a single board to be composed of seven members and known as the State Hospital Board. In addition to the powers of the special boards, etc., the State Hospital Board exercises all duties and functions of the Commissioner of State Hospitals previous to the abolition of that office. The present State Hospital Board, with the advice and counsel of its able director, Dr. H. C. Henry, is gradually developing a unified state-wide program, which in due time will place the Virginia hospital system in a position second to none. Already many uniform procedures have been adopted, a central statistical system has been developed, repeated inspections and visitations are made, much stimulation is given to the hospital personnel, and a broad general plan is evolving.

Training and Educational Activities.

Medical students from the two medical schools spend some time in several of the hospitals and under the guidance of the hospital staffs are getting a proper concept of the problem of mental disease. The position of director of clinical psychiatry has been added to the staff of each hospital caring for the mentally ill. These physi-

cians are doing much to increase the psychiatric work with patients and also in developing extramural activities.

The Board has also employed a full time instructress for nurses and attendants, who spends her time in the several hospitals conducting, with the assistance of the staffs, formal courses of instruction in psychiatric nursing and attending. Already much good can be seen from this activity. The State Nursing Association has shown a renewed interest in providing some psychiatric training for student nurses.

Staff physicians have been urged to take advantage of formal post-graduate courses in psychiatry, without loss of pay, even though it does curtail the working staff of the hospital. In fact, the State Hospital Board is encouraging all that will improve the condition and fate of all the patients under its supervision.

Extramural Activities.

One of the early policies of the State Hospital Board was the sponsoring and establishment of out-patient clinics by the several institutions under its control. As a result each institution is establishing such clinics as rapidly as personnel will permit.

Children's Memorial Clinic.

The need for a children's clinic in Richmond had been emphasized by several surveys previous to 1924, and the need had been recognized by the Judge of the Juvenile Court, medical men and leaders of social agencies. As a result of plans submitted by Dr. Richard A. Bolt, of the American Child Health Association the Children's Memorial Clinic was opened on August 7, 1924.

One half of the financial support for the first two years was given by the Commonwealth Fund of New York, the balance was provided by the community, local and state donations. Field consultants of the National Committee for Mental Hygiene with the assistance of local psychiatrists rendered psychiatric service. Later developments made it possible to employ a full time director-psychiatrist. At the present time this clinic restricts its services to the children from the city of Richmond and Henrico and Chesterfield counties. Patients are received from schools, social agencies, the Juvenile Court and private physicians.

The State Mental Hygiene Bureau.

When the Children's Memorial Clinic was organized in 1924, the state made a contribution to its support through the Department of Public Welfare, which had many child problems for which psychiatric consultation was needed.

In 1928, through legislative authorization, the Department of Public Welfare established its own Bureau of Mental Hygiene for the purpose of carrying on an educational program but largely for the purpose of providing psychiatric examinations for children committed to the Department from the various counties and to act in an advisory capacity as to proper management of these children. Although personnel has been limited, this clinic has been doing valuable service.

Medical College of Virginia.

Department of Neurology and Psychiatry.

Prior to 1912, neurology and psychiatry were taught at the old Medical College of Virginia by Dr. H. H. Levy, who was professor of medicine. In 1912, a separate department for the teaching of neurology and psychiatry was organized and Dr. Beverley R. Tucker was made professor. In 1913 the University College of Medicine consolidated with the Medical College of Virginia. Instructions in the two subjects had, in the former school, been under the direction of Dr. J. Allison Hodges for some years before the consolidation. In 1938 Dr. Tucker became emeritus professor of neuropsychiatry, and Dr. R. Finley Gayle, Jr., was promoted to the position of professor. In March 1940 Dr. P. H. Drewry, Jr., became assistant professor of psychiatry and the only full time member of the teaching staff. The neuropsychiatric teaching staff at present numbers 23 physicians. The instruction is so outlined that each year the medical student is presented some phase of the study of psychiatry.

In 1907 Dr. Beverley R. Tucker established an out-patient clinic in the basement of the Old Dominion Hospital, where ambulatory patients were seen once a week. In 1918 this clinic began to meet twice weekly. In December 1937 the entire out-patient department of the school moved to the present clinic building at

the corner of 12th and Marshall Streets and by 1939 the neuropsychiatric clinic was meeting four afternoons a week in this building. There are now four physicians present for each clinic four times per week and, excepting holidays, four or five senior medical students. The patients average ten to fifteen for each clinic with from one to three new patients. About one-third of these are neurological cases, the balance being psychiatric.

Patients, both children and adults, are received from social agencies and from other clinics for diagnosis and treatment. There is a small occupational therapy department, under the supervision of an occupational therapist, where patients are seen twice weekly.

In the new Medical College of Virginia Hospital one entire floor, with a minimum capacity of 28 beds, is completely equipped for the care and treatment of psychiatric cases.

University of Virginia.

Department of Neurology and Psychiatry.

Prior to 1939 there was no separate department of neurology and psychiatry at the University of Virginia. In 1929 the department was created as a subsidiary department to general medicine and an associate professor of neurology and psychiatry was appointed. Patients were still housed in the medical wards of the University Hospital and under the direct charge of the medical house officer.

The first resident on neurology and psychiatry was Dr. James C. King, now of St. Albans Sanatorium, Radford, Va. A child guidance clinic was also attempted in 1930-1 and the neuropsychiatric out-patient service was divorced from the medical outpatients. This department is now a very active one, and its development must be credited largely to the untiring efforts and irresistible personality of Dr. David C. Wilson.

In 1933 a gift from Mr. Paul McIntyre made it possible to employ a psychiatrist and a social worker. Soon after, at the suggestion of Dr. Paul Anderson, Mr. McIntyre gave what is known as Pantops Estate to the department, with the idea that a psychiatric institution could be placed there. Lack of funds prevented the realization of this plan, and then too it seemed better to locate any psychiatric facilities closer to the University Hos-

pital. Pantops Estate was eventually sold, the previous donation of Mr. McIntyre was added to the proceeds and with the assistance of P. W. A. funds, a psychiatric pavilion with two floors was constructed. The arrangement and workableness of this facility should be seen by those interested in psychiatric treatment. This pavilion was opened in 1939 and during the first six months admitted 245 patients.

The objects of the neuropsychiatric pavilion as stated are: 1. To instruct the medical students and nurses in neurology and psychiatry. 2. To give the best care possible to the patients coming for treatment. 3. To give post-graduate training to nurses who wish it and to the house staff as well as any other physicians who wish to attend. 4. To establish a research center in neurology and psychiatry.

The Neuropsychiatric Society of Virginia.

The organization of this Society developed from a desire on the part of physicians practicing neurology-psychiatry and neurosurgery to become more closely associated in a scientific and professional manner and at the same time be in a position to take more concerted action toward improving the neuropsychiatric facilities and activities in Virginia. Since the first official meeting, January 24, 1936, the Society has met regularly three times each year for the presentation of scientific and clinical papers. The present membership totals forty-nine; the officers are: Thos. H. Spessard, M. D., Norfolk, President; W. Gayle Crutchfield, M. D., Richmond, Vice-President and Edward H. Williams, M. D., Richmond, Secretary and Treasurer.

The Mental Hygiene Society of Virginia.

This Society, formally organized February 19, 1937, having been incubated and nurtured by such outstanding psychiatrists as Drs. James K. Hall, Beverley R. Tucker, R. Finley Gayle, Jr., Howard R. Masters, O. B. Darden, Thos. Spessard, and others, including many non-medical citizens, must be credited with much of the present trend and psychiatric progress in Virginia.

North Carolina.

The name of Dorothy Linde Dix stands in the foreground when one begins to study the development of state hospital care for the mentally ill in North Carolina. As early as 1841, however, Governor Moorehead had recommended the establishment of an asylum, but his foresight, interest and attempt to bring action failed. In 1848 Miss Dix, in one of her famous memorials, said to the legislature,

> I come not to urge personal claims nor to seek individual benefits. I appear as the advocate of those who cannot plead their own cause. In the Providence of God, I am the voice of the maniac whose piercing cries come from the dreary dungeons, of your jails—penetrate not to your halls of legislature. I am the hope of the poor crazed beings who pine in cells and stalls and cages of your poor houses.

Even this dramatic appeal failed to bring action at first and it remained for the well-timed appeal of a legislator, Representative James C. Dobbin, to bring about the establishment of the Raleigh State Hospital, which was opened in 1856. The hospital had an original capacity for 224 patients. This was increased in 1870 to 250. The present capacity is approximately 2250 beds.

Morganton State Hospital, serving the western part of the state, was established in 1875 and opened March 29, 1883. Although legislative authorization was given and an appropriation of $75,000 was made in 1875, and a site provided by the Town of Morganton, plans drawn and foundations built, opposition brought about a cessation of construction and work was not resumed until 1877. The institution has had three superintendents, the present incumbent being Dr. F. B. Watson.

The Goldsboro State Hospital, established in 1877 and opened August 1, 1880, is exclusively for the care of colored patients. It also contains facilities for the colored criminal insane of the state.

In 1911 the legislature established the Caswell Training School for white mental defectives. The opening date was July 1, 1914.

Other psychiatric facilities in North Carolina are: Broadoaks Sanatorium, Morganton; Highland Hospital, Asheville; Appalachian Hall, Asheville.

Mental Hospital Survey.

In 1935 the legislature authorized the Governor to appoint a commission for the study of the care of the mentally ill and defective of the state. Dr. Lloyd J. Thompson, of the Yale Institute of Human Relations, directed the survey, which was financed by the Rockefeller Foundation. The report, an outstanding example of completeness and thoroughness, was published in 1937. As the result of recommendations made, during the biennium ending June 30, 1940, approximately $4,250,000 have been spent in improving the physical plants of these institutions. Very little, if any, increase in capacities resulted. Recommendations made regarding personnel and standards of medical and psychiatric care certainly provide a reasonable goal for future achievement.

Extramural Activities.

The several institutions are under the supervision of the State Board of Charities and Public Welfare but under the immediate control of a Board of Directors and a superintendent. In 1921 a Division of Mental Hygiene was organized in the State Board. The Division operated under the direction of Dr. H. W. Crane, a psychologist, until 1938 when he resigned to take up service with the University of North Carolina. The position of director was then filled by the appointment of a psychiatrist, Dr. James Watson.

In the meantime a children's unit was organized in the Division of Mental Hygiene. This unit, under the direction of Dr. Richard F. Richie, is conducting child guidance clinics at Charlotte and Winston-Salem. As yet, it has been impossible to develop any extramural clinics from the state hospitals.

The duties of the Division are stated as follows:

1. Provide psychiatric examination service so far as possible to institutions, both public and private, schools, courts, county welfare departments and agencies.
2. Interstate transfer of mental patients.
3. Providing a state clearing house regarding mental patients by filing pertinent data concerning such patients.
4. Development of research and preventive measures along mental hygiene lines.
5. Assemble and interpret statistics on mental health.

6. The inspection of state hospitals and state schools for mental defectives, and the inspection and licensing of all private mental hospitals.
7. Educational service through talks, pamphlets, etc.
8. Consultation service to all state agencies and institutions.
9. Integrate local welfare departments with state hospital service for supplying from local units of public welfare case histories and financial investigation of patients, admitted to state hospitals, and supervision of patients during parole and after discharge from state hospitals.
10. Foster the development of child guidance clinics and mental hygiene clinics in urban communities and traveling mental hygiene clinics for rural areas.

Duke University Medical School.

The Mental Hygiene Survey previously mentioned points out not only the shortcoming throughout the state but at the Duke Medical School as well. Thus stimulated Duke began to move.

In February, 1940, the Rockefeller Foundation subsidized the organization of a separate department of psychiatry and the medical and auxiliary staffs were notably increased. In-patient and out-patient clinics were established. In January, 1941, a separate psychiatric ward of 16 beds on the third floor of the main hospital building was established. There are facilities for research in electroencephalography, electroneurophysiology and shock therapy.

A full time residency in psychiatry has been established and beginning 1941-42, there will be a concentration of teaching hours devoted to psychiatry in the curriculum of the medical school. Opportunity will also be afforded students to work in both in-patient and out-patient clinics.

South Carolina.

Some recognition was given to the mentally ill in South Carolina as early as 1751. In this year an old statute, dating back to 1737, was amended to provide for the subsistence of slaves who became "lunaticks" while belonging to persons "too poor to care for them." This act required justices of the peace and overseers of the poor "to cause such lunatic slaves to be secured in some convenient place in the parish, as well as to prevent their doing mischief as for the better subsisting of such lunatic slaves, the expenses to be borne by the parish."

The Fellowship Society of Charles Town, established in 1762, had for its object the development of a hospital "for the reception of lunatics and other distempered persons in the province." Apparently plans were made to erect a hospital but there is no evidence that it was ever built.

On December 21, 1821, an Act of the General Assembly authorized the erection of a lunatic asylum and a school for the deaf and dumb, the two to be combined.

As early as 1813 Col. Samuel Farrow of Spartanburg, S. C., a "patriot of '76," and at that time a member of the legislature, projected the establishment of a lunatic asylum but failed. Repeated efforts continued to fail until he was able to enlist the assistance of a younger member, William Crafts, Jr., of Charleston, who was interested in the deaf mute problem. After Col. Farrow's success with the asylum, he declined further public honors and died in 1824. Crafts died in 1826, so neither of these gentlemen saw the results of their efforts. The institution was opened in December 1828, and the first patient was a young white woman whose mother came with her as matron in order to take care of her.

For many years nothing was known of the architect of the plans of this institution. By some coincidence, however, a set of plans and elevations of the "Asylum at Columbia, S. C." was found in the attic of the McLean Hospital, at Waverly, Mass., by Dr. George T. Tuttle, and sent to Dr. Babcock, who was at the time superintendent of the South Carolina institution. The designer and architect was Robert Mills, and it seems probable that this original building is the oldest existing asylum building in the United States erected by a state for its insane.

From 1828 to 1836 the superintendents of the asylum were laymen. Dr. James Davis served as visiting physician from 1828 to 1835 when a new system, which Dr. Davis had long advocated, was inaugurated, and Dr. J. W. Parker, of Abbeville, S. C., was named resident physician and superintendent.

For many years this institution took patients from neighboring states which were lacking in such accommodations. When these other state did begin to make plans for their own institutions the location of the South Carolina asylum in the city served as a warning to them to place their institutions outside.

In time this location of the institution became a matter of much controversy and had much to do with the development of the hospital. This controversy was waged from 1848 to 1856. One faction, led by Dr. Trezevant, wished to abandon the original site in the city of Columbia and rebuild several miles out in the country; opposing was Dr. Parker, who preferred to retain the original Mills structure and erect additions on adjoining property. The latter policy finally prevailed.

It would hardly behoove one to try to mention all the vicissitudes of this institution, but it is still serving the entire state of South Carolina and at the present time, under the superintendency of Dr. C. Fred. Williams, is carrying on quite an active intramural and extramural program.

Georgia.

For quite a number of years, the State of Georgia used the facilities for the insane that had been established in South Carolina. The first reference to any activity toward the development of a hospital in Georgia is contained in the annual message of Governor Wilson Lumpkin to the combined houses of the legislature in 1834. He recommended favorable action but apparently this was not taken.

Three years later (1837), the legislature yielded somewhat reluctantly to the entreaty of a northern philanthropist and a group of distinguished physicians, Drs. White, Fort, Case and Green, who were assisted by Drs. Phillips and Arnold and by Judge Harris, who were members of the legislature.

Dr. T. O. Powell states in his article, "A Sketch of Psychiatry in the Southern States" (Transactions of the American Medico-Psychological Ass'n, Vol. IV, 1897) "that year [1837] there came to Milledgeville a northern philanthropist, whose object was to petition the legislature to do something for them" [the insane].

> "No blare of trumpets sounded out his fame
> He lived, he died—I do not know his name!"

A commission purchased the site and the work on buildings began at once, but owing to financial depression the Georgia State Sanatorium at Milledgeville was not ready for the reception of patients until December 1842. Originally the counties paid for their indigent insane but in 1846 this policy was replaced by state

care. At first the institution was in charge of a layman with a physician employed when his services were needed but in 1843 a physician was appointed as superintendent.

The original capacity of the institution was not stated, but prior to 1877 patients were received from other states. The name has been changed to the Milledgeville State Hospital and during the year 1940 buildings for 3,000 beds have been added at a cost of approximately $4,500,000, bringing the capacity to 7,500. It is the only state mental hospital in Georgia. The land holdings are about 5,000 acres. The medical staff consists of 18 physicians and there are approximately 800 nurses and attendants.

Other psychiatric facilities in Georgia are Allen's Invalid Home, Milledgeville, established in 1890, the first private mental institution south of Baltimore; Dr. Brawner's Sanatorium, Smyrna, established in 1910; the Veterans Administration Facility, Augusta, established in 1920, has a capacity of 1,016 beds and is a training hospital for young physicians inducted into the neuropsychiatric service of the Veterans Administration; the Owensby Clinic; the Brook Haven Manor Sanatorium; and the Edna Haslup School, all of Atlanta, are under the direction of Dr. Newdigate Moreland Owensby, who was mainly influential in the organization of the Southern Psychiatric Association.

The University of Georgia Medical College, at Atlanta, has a full time professor of psychiatry, with a most liberal allotment of hours in the curriculum; and Emory University, Atlanta, has a division of neuropsychiatry as a subsidiary of the department of medicine. A psychiatrist is the associate professor and chairman of the neuropsychiatric faculty, with an allotment of 105 hours for instruction in three of the four years of its medical course.

Comment.

SIR FREDERICK BANTING.

Just across the street from the great Toronto General Hospital stands an imposing modern structure devoted to medical research. In the main corridor as you enter there greets you from the wall a portrait, the strong, friendly countenance of the presiding genius of the place. It is the face of Sir Frederick Banting, and the building is the Banting Institute of the University of Toronto. Here is housed the Banting and Best Department of Medical Research, established in 1923 by means of a special grant of the Legislature of the Province of Ontario. The preamble to the act to set up the Banting and Best Research Fund opens as follows:

> WHEREAS, F. G. Banting, M. D., and C. H. Best, B. A., in the prosecution of medical research have made an important discovery by means of which it is now possible to ameliorate the condition of persons suffering from the disease known as diabetes, and it is believed that prosecuting the research will result in perfecting a remedy for the cure of that disease, and it is desirable and expedient in the public interest to provide by legislative grant the continuation and prosecution of kindred researches.

That same year Banting was the recipient of the Nobel Prize for medicine.

As first occupant of the chair of the newly created department Banting gathered about him during the years a group of brilliant investigators in various fields of medicine, and their work together constitutes one of the most remarkable chapters in the history of the healing art.

A veteran of the Great War of 1914-1918 in which he was severely wounded, Banting placed the facilities of his department at the disposal of the military authorities at the opening of the present war and was soon himself again in uniform. His contributions and those of his staff to aviation medicine are of the very first importance. It was on a mission to England in connection with this work that this great physician lost his life in an airplane crash February 21, 1941, on the bleak coast of Newfoundland.

Thus Canada lost her foremost citizen, humanity one of its greatest benefactors, the world one of its most illustrious scientists.

Sir Frederick's reaction to the use of insulin in the treatment of mental disorders was interesting. When several years ago Dr. Theodore Dussik of the Vienna clinic came to Toronto to address a psychiatric group on hypoglycemic shock therapy, Dr. Banting was invited to attend the meeting and to discuss the paper. He was reluctant to speak. The procedure obviously did not satisfy his scientific conscience, and he said little more than that while the reports were interesting, insulin could not be regarded as in any sense a specific for the mental conditions under discussion. A wholly empirical method of treatment which in some instances had been followed by rather surprising subsidence of symptoms did not intrigue him. What did concern him was the physiological or biochemical processes which might underlie or be associated with the mental changes. Given that psychiatric problem and his interest was keen and whole-hearted, and the Toronto group in psychiatric research were fortunate and happy in his very generous collaboration. It is gratifying to recall that the last thing Dr. Banting did before leaving his laboratory on that fateful flight, bound for Britain, was to scrutinize the results of certain laboratory observations upon a group of schizophrenic patients undergoing insulin therapy, and to offer suggestions for the further experimental procedure.

At the meeting of Council in December the name of Sir Frederick Banting was proposed for honorary membership in The American Psychiatric Association; but for the tragedy on that remote Newfoundland shore, this nomination would have come before the annual meeting in Richmond and the Association would have honored itself by adding to its rolls the name of this great scientist, whose searching interests lay in all the fields of medicine, not least of these, psychiatry.

On memorials dedicated to those who have given their lives in the service of their country are commonly found the words:

Their Name Liveth Forevermore

among the foremost of these perduring names stands that of Sir Frederick Banting.

News and Notes.

PSYCHIATRIC NURSING GRADUATE COURSE.—The New York State Department of Mental Hygiene offers to qualified graduate nurses a course of eight months in psychiatric nursing at the Psychiatric Institute. Nurses who have had 3 or 4 months affiliation are given preference. The class will be admitted October 1, 1941. Full maintenance is provided during the course.

For further information address: Director of Nursing, N. Y. State Psychiatric Institute and Hospital, 722 West 168th Street, New York, N. Y.

JOHN PHILLIPS MEMORIAL AWARD 1941.—On recommendation of the Committee on Fellowships and Awards, the Board of Regents of the American College of Physicians has awarded the John Phillips Memorial Medal for 1941 to Dr. William Christopher Stadie, associate professor of research medicine at the University of Pennsylvania, for his significant contributions to the knowledge of anoxia, cyanosis and the physical chemistry of hemoglobin, and more especially for his recent studies on the subject of fat metabolism in diabetes mellitus.

This award was established by the College in 1929, to be given periodically for outstanding work in internal medicine and its contributory subjects. The work must have been done in whole or in part in the United States or in Canada.

Nominations for the award are made to the Committee on Fellowships and Awards of the American College of Physicians. The recipient must file with the College a written account of his work, and present his paper before the next annual session, at which time the award of a bronze medal is made by the president of the College.

RORSCHACH COURSE, MICHAEL REESE HOSPITAL.—S. J. Beck, Ph. D., head of the psychology laboratory, will offer his usual

summer course in the Rorschach test in personality study and clinical diagnosis in two two-hour periods daily for five days, June 23-27, 1941.

The course teaches the technique of administering the Rorschach test and scoring the responses. It orients the student in interpretation with especial emphasis on clinical classification. Response records obtained from various healthy personality groups and from clinical groups (schizophrenia and some neuroses) will be scored, analyzed and interpreted. Primary aim of the course will be to demonstrate the test's practical application in investigating the whole personality, with particular reference to its clinical use.

Interested persons are invited to communicate with the Medical Librarian, Michael Reese Hospital, 2908 Ellis Avenue, Chicago, Ill.

DR. MERRILL MOORE HEADS THE WASHINGTONIAN HOSPITAL.—It is announced that Dr. Merrill Moore has been appointed medical director of the Washingtonian Hospital in Boston. This institution, founded in 1858, for the study and treatment of alcoholism, has been reorganized during the past year. Provision has been made for a psychiatric staff and the program of the hospital has been enlarged to include research as well as treatment of alcoholism.

Under the new administration the Washingtonian Hospital may be expected to make a contribution to the solution of the alcoholism problem, now belatedly receiving more concerted scientific attention by reason of the activities of the newly formed Research Council on Problems of Alcohol.

FELLOWSHIPS AT AUSTEN RIGGS FOUNDATION.—The Austen Riggs Foundation, Inc., of Stockbridge, Mass., is offering two psychiatric fellowships, each of one year's duration. They provide an opportunity for study of the psychoneuroses and experience in the treatment of both in- and out-patients. Both fellowships begin on July 1, 1941. The stipened is $2,500 without maintenance.

Candidates should have completed a general internship of at least one year. Although it is preferable that candidates shall have had some experience in general psychiatry and neurology, this is not a prerequisite. It is the belief of the Foundation that an oppor-

tunity to work with psychoneurotic patients is a valuable experience for an internist, and for this reason one or both of these fellowships may be granted to suitable candidates to provide such training.

The American Board of Psychiatry and Neurology recognizes these fellowships, and a year at Stockbridge may be counted as one of the three years of special study required for certification.

Application may be made to Charles H. Kimberly, M. D., Medical Director, Austen Riggs Foundation, Stockbridge, Mass.

Death of Dr. Charles D. Mitchell.—One of the most outstanding psychiatrists in the South, Dr. Charles Dennis Mitchell, superintendent of the Mississippi State Hospital, died at the age of 74, January 25, 1941. Dr. Mitchell had occupied the post of hospital superintendent since 1918. In 1933 he experienced the fate of many public servants in the field of psychiatry when incoming governors decide to clean house. With the reverse swing of the political pendulum he was restored to his position in 1936.

To Dr. Mitchell was mainly due the establishment of the splendid $5,000,000 institution at Whitfield, ten miles east of Jackson, Mississippi, which was opened in 1935. This is the new Mississippi State Hospital, a self-contained community of seventy modern, well-equipped, fireproof buildings, situated on a tract of land embracing more than three thousand acres.

Dr. Mitchell was a pioneer in modernizing the care of the mentally ill in his state and the hospital at Whitfield, one of the show places of the state, is a tribute to his foresight and a monument to his memory.

Civilian Mental Health.—The Military Mobilization Committee of the American Psychiatric Association has set up a subcommittee to deal with civilian mental health. Foremost among the problems under consideration is the matter of maintaining adequate psychiatric service for the civilian population. A number of psychiatrists have already been called out for the armed forces and a considerable amount of time is devoted by psychiatrists in private practice to examination of men called under the Selective

Service Act. It seems probable that the demands made by the armed forces will increase considerably.

Several methods of maintaining adequate psychiatric service have been considered by the subcommittee. Among them is the promotion of community psychiatry and closer interaction with social agencies and other organizations interested in social welfare.

With this in mind the subcommittee has requested the various psychiatric journals throughout the country to give publicity to this matter and has also communicated with the regional psychiatric societies and branch associations suggesting their consideration of problems of community mental health organization during the present critical period.

CINCINNATI SOCIETY OF NEUROLOGY AND PSYCHIATRY.—Announcement is received of the organization of the Cincinnati Society of Neurology and Psychiatry, recruited from the membership of the Cincinnati Academy of Medicine and of the American Medical Association resident in the city or environs who devote the major part of their work to neurology and psychiatry.

The first scientific meeting was held at the University Club January 23, 1941. It is planned to hold four meetings a year during the winter months. There are 32 charter members.

The officers are: Thomas A. Ratliff, M. D., president; E. Armitage Baber, M. D., vice-president; Charles D. Aring, M. D., secretary-treasurer.

COMMONWEALTH FUND FELLOWSHIPS IN PENAL PSYCHIATRY, 1941-1943.—A fellowship in penal psychiatry in the University of Pennsylvania, provided by the Commonwealth Fund is now available. Term of fellowship—2 years. Stipends, $2,400 first year; $2,800 second year. Minimal qualifications specify graduate physician not older than 35, having accredited internship and at least two years of acceptable psychiatric training. Address inquiries to Philip Q. Roche, M. D., Secretary, Committee on Medico-Legal Fellowships, 255 S. 17th Street, Philadelphia, Pa.

THE MEDICAL SOCIETY OF ST. ELIZABETH'S HOSPITAL.—The fourth annual meeting will be held in Washington, D. C. April 26, 1941. Members of the Society will be luncheon guests of Dr. Winfred Overholser and Mrs. Overholser, and the afternoon will be devoted to the presentation of papers by members of the Society. The annual dinner will be held in the evening at the Mayflower Hotel, and Sir Willmott Lewis, Washington correspondent of the London Times, will be the guest speaker. Further details concerning the meeting may be obtained from the Secretary, Dr. Manson B. Pettit, St. Elizabeth's Hospital, Washington, D. C.

THE ADVISORY COUNCIL FOR RESEARCH IN NERVOUS AND MENTAL DISEASES.—For several years the United States Public Health Service has been considering the advisability of establishing an institute to carry on research in nervous and mental diseases. Finally, on the recommendation of the Scientific Administration Committee of the National Committee for Mental Hygiene, Surgeon General Thomas Parran appointed an advisory council to consider the matter. The members of this council are Edward A. Strecker, Nolan D. C. Lewis, Lloyd H. Ziegler, Abraham Myerson, Arthur H. Ruggles, Henry Woltman and R. Finley Gayle, Jr.

A meeting of the council was held in Washington, December 16, 1940, with the Surgeon General presiding. Lawrence Kolb, Chief of the Division of Mental Hygiene of the Public Health Service, and Winfred Overholser, Superintendent of Saint Elizabeths Hospital, participated in the discussion. The council called attention to the enormous prevalence of nervous and mental diseases and to the relative paucity of research in these diseases as compared with research in other medical conditions. It considered the necessity for and possibilities of extending research and the methods by which it should be promoted, with the double objective of the relief of suffering and the reduction of the economic burden caused by these diseases. The work already being done in several centers by tax-supported or semi-official agencies, and elsewhere through grants from foundations was considered as suggesting methods of approach to the research problem. Certain recent discoveries were pointed to as opening up fields that need to be extensively explored. Attention was called to the enormous amount

of material and talent throughout the country that is not being utilized because of lack of financial support.

The council concluded that the situation should be met by the establishment in the Public Health Service of an institute modeled after the National Cancer Institute, but with certain modifications necessary to meet the nervous and mental disease situation. It was agreed that the institute should have extensive laboratory facilities for the study of basic biological, biochemical, physiological, pathological and psychological problems, and that it should have beds for patients necessary for certain types of research. It was also agreed that the institute should have facilities for carrying on field studies in nervous and mental diseases and that it provide for research fellowships and for the training of personnel for work at the institute and elsewhere. It was proposed that the institute have a national advisory council and that it have funds to be allotted for the carrying on of meritorious research projects by other organizations and at other places, after such projects have been passed upon and approved by the national advisory council. It was also suggested that the institute should act as a source of information for research workers in the mental and nervous disease field, so that unnecessary duplication of work be avoided and a coordination of effort achieved.

The council recommended to the Surgeon General that the Public Health Service take measures to establish, as a Division in the Public Health Service, such an institute, in or near the District of Columbia, and that the institute work in close cooperation with Saint Elizabeths Hospital and the National Institute of Health, so as to take full advantage of existing Federal facilities to achieve its objectives.

JELLIFFE LIBRARY ACQUIRED BY NEURO-PSYCHIATRIC INSTITUTE OF HARTFORD.—Acquisition of a 15,000 volume medical library, described as the most complete of its kind in the world, has been announced by Dr. C. Charles Burlingame, psychiatrist-in-chief of the Neuro-Psychiatric Institute.

The library, representing a lifetime of collecting by Dr. Smith Ely Jelliffe of New York, editor of the *Journal of Nervous and*

Mental Diseases and the *Psychoanalytic Review,* is to be transferred to the Institute in accordance with the wish of Dr. Jelliffe "to assure a permanent home for it under conditions which would be of satisfying benefit to future generations of psychiatrists and neurologists."

Mr. Morris C. Leikind of the Library of Congress states:

> The Jelliffe collection in neurology and psychiatry is probably the largest and most complete private library in its field in the country. In addition to the 15,000 volumes it contains 25,000 reprints and covers every aspect of the fields in which Dr. Jelliffe is regarded as a master. The psychoanalytic section is one of the best collections of its type to be found anywhere. The value of this collection as an instrument of research lies in its totality. It represents not only a lifetime of single minded collecting, but a lifetime of research and contributions to knowledge. The breakup of the collection would therefore destroy the very thing which Dr. Jelliffe tried to create—that is, its unity.

Included in the collection are some rare historical works dating back to the 15th century as well as practically all important psychiatric monographs from the time of Pinel and Esquirol to the present day. Reprints include contributions from practically every civilized country and because of the unique method of binding used by Dr. Jelliffe, grouping together all reprints concerning a specific subject or disease, it is possible for the research worker to trace the development of a given subject with the utmost facility.

Title to the library has already passed to the Neuro-Psychiatric Institute, and provision is now being made to house the collection so that it will be readily available not only to the medical and research staffs of the Institute but to other qualified workers throughout the country.

In making the announcement Dr. Burlingame said:

> Dr. Jelliffe has been for more than 40 years one of the outstanding national leaders in psychiatry, forming a triumvirate with Dr. Adolf Meyer of Baltimore and the late Dr. William A. White of Washington, which has been responsible more than any other group for the progress made in this field of medicine during our time. We feel signally honored to be the repository for the great treasures embodied in Dr. Jelliffe's collection.

THE NATIONAL HOSPITAL, QUEEN SQUARE.—The "National," the oldest and largest hospital in the United Kingdom devoted to

treatment of diseases of the nervous system has suffered grievously under the Nazi horror. The large extension of the hospital, which was opened in 1938, has been bombed and severely damaged and havoc has been wrought within its wards.

Though battered and scarred this great institution still carries on its work and its traditions; but financial support is urgently needed both for current operations and the later repair of damaged buildings. The hospital being a voluntary one depends entirely on its friends and the public for its maintenance.

To many readers of the JOURNAL visits to the "National" are happy memories. From those in a position to help donations will be most gratefully received and acknowledged by: Sir George Broadbridge, Bart., K.C.V.O., Chairman of Appeal Committee, National Hospital, Queen Square, London, W.C.1.

PORTRAITS OF PSYCHOTICS BY DR. GERTRUD JACOB.—At the annual meeting of the Association in Richmond will be exhibited a series of portraits of mentally ill patients painted by a psychiatrist, the late Dr. Gertrud Jacob. Through the skill of the artist one may discern in these paintings the effects upon individual patients of various psychotic processes.

A native of Kiel, Germany, daughter of a physician, Dr. Jacob was practicing in Hamburg in 1933 when the Nazi blight fell upon her country and she was obliged to find sanctuary elsewhere. Since 1935 she had made her home in the United States. She died last year in New Mexico whither she had gone seeking health.

In this exhibit are shown portraits of patients at the Heidelberg Clinic, painted by Dr. Jacob between the years 1928-30 whilst serving on the staff of that hospital.

Book Reviews.

NEW FACTS ON MENTAL DISORDERS—Study of 89,190 Cases. By *Neil A. Dayton, M. D.* (Springfield, Ill.: C. C. Thomas, 1940.)

This volume is at once a monument, and a worthy one, to the far-sighted genius of the late Dr. George M. Kline, to the generosity of the Rockefeller Foundation and to the persevering thoroughness and the statistical brilliance of the author, Dr. Dayton. It is, indeed, one of the most important additions to the psychiatric literature yet made, presenting as it does a wealth of new information about the "epidemiology" of mental disorder. The period studied (1917-33) embraced the World War, demobilization, prohibition, various economic changes and finally the depression; the number of patients studied (almost 90,000) is statistically significant; the results in some cases confirm old "hunches," while in others they are novel and indeed startling. The fact that the study has been steadily in progress since its inauguration in 1928 gives some inkling of the enormous amount of painstaking statistical work the book represents. The study was made in the state hospitals of Massachusetts, a state provided with temporary care and voluntary admission laws, a relatively simple method of regular commitment, and adequate hospital facilities; in other words, the admissions studied were not warped by legal or other adventitious considerations.

A volume like this, crammed with important facts, presents a problem to the reviewer: abstracting nearly 500 pages of statistical data is impossible. One can only point out a few of the findings, with the assurance that the interested reader will wish to study the details for himself.

Item 1: "In every age group the males show higher admission rates than the females." (p. 56) Indeed, in the 20-29 year group, males predominate by 37 per cent. So much for masculine superiority!

Item 2: "Mental disorder is a disease of old age." Dayton points out that the assumption that mental disease has its greatest incidence in middle life is based upon a statistical fallacy, namely failure to consider the "steadily decreasing numbers of persons in the various ages . . . . from infancy to old age." Dayton has studied the rates, that is, the number of persons of a given age admitted compared with the total number *of the same age* in the general population. By this means he demonstrates that the rate for the 20-29 group is nearly four times as high as for the decade 10-19, and that the rate for the 80-89 decades is nearly twenty times as high! He suggests the importance as factors not only of the failure of physical resources, but also of failure in the social or economic sense, and likewise of the removal of protection through death or divorce of the spouse. The close corre-

spondence of the age curves for mental disease and for death is pointed out, as is also the truth as to the alleged "increase in the average length of life," an "increase" which has been due almost entirely to "the saving of lives in infancy, early childhood, and the first two or three decades." (p. 64).

Item 3: If the intemperate use of alcohol in all admissions rather than in the Alcoholic Psychoses only is considered (32 per cent of first admissions intemperate) one is inclined to agree with Dayton that "in a large proportion of patients coming to mental hospitals alcohol is the outstanding factor in the history of the mental disorder." (p. 150). The lower amounts of alcoholism from 1924 onward that "future mental patients did not turn to alcohol as a means of escape from the difficulties of unemployment and the depression." (p. 145).

Item 4: The significant factor in the mounting population of state hospitals is *not* mounting admissions. "About $\frac{5}{6}$ of the increase in hospital beds has been due to patients occupying beds for more than one year plus gradual increases in length of hospital stay. Only $\frac{1}{6}$ of the observed increases in resident population has been due to increases in the number of admissions from year to year. Mental disorders are increasing, but so gradually that all apprehensions as to the seriousness of the situation may be discarded." (p. 417). By a close statistical study of actual situations, Dayton shows that for every 1000 beds only 214 can be devoted to an active service, the rest being occupied throughout the year by long-term patients. Furthermore, he finds that from 1929 to 1937 the average time in hospital of all patients in residence at the end of each statistical year increased from 8.9 years to 9.7 years. These two facts illustrate effectively the damming-up process which has led to the rather alarming growth of our mental hospitals, and cause Dayton to close with the following unanswered query (p. 438):

> "Here we have two implications (1) that society has been unable to absorb recovered patients ready for discharge to as great an extent in recent years as in past years and (2), that changes are taking place in the recoverability of existing mental disorders, which necessitate a longer period of hospital residence for purposes of treatment. Either question offers a major challenge to the psychiatrist, to the administrator and to society as a whole."

Such are a few glimpses of this most illuminating volume. Some of the chapters not touched upon above are entitled: Nativity and Mental Disorders; Marriage and Mental Disorders; Marital Status and Other Factors; Clinical Diagnosis in Mental Disorders—Age; Clinical Diagnosis and Changing Incidence—Time Factors. Each chapter is preceded by a summarization of its contents, so that the pertinent facts may be quickly gathered, and the absorbability of the material is greatly enhanced by the presence of 110 graphs and 84 tables.

Dr. Dayton's contribution to our knowledge should be carefully read and pondered by psychiatrists (especially mental hospital administrators), so-

ciologists, public welfare authorities, legislators and all who seek a balanced view of one of the most important and pressing problems of our social organism—mental disorders.

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EXTRA-SENSORY PERCEPTION AFTER SIXTY YEARS. By *J. G. Pratt, J. B. Rhine, Burke M. Smith, Charles E. Stuart, and Joseph A. Greenwood.* (New York: Henry Holt & Co., 1940.)

Since it was the aim of the nineteenth century to bring into the laboratories of science everything human as well as everything physical, the time came when scholars insisted that laboratory studies must be made even in relation to those phenomena of the borderland, the age-old phenomena of hauntings, clairvoyance, telepathy. Experimental tests of telepathy at long distance followed the inauguration for the Society for Psychical Research in London in 1882. In four more years a committee of three scholars had prepared two huge volumes of carefully sifted evidence covering both the experimental and the "spontaneous" cases of apparent contact between mind and mind over long distances. This two-volume work, "Phantasms of the Living," remains the monumental presentation of data on telepathy. It has never been brought up-to-date. In that era, however, the number of air-tight experiments was small. A few more were done, but it was not until 1921 that a rigidly controlled experiment was conducted by members of a psychology department (in the Netherlands); four years later, a similarly well-controlled study was done at Harvard.

Psychical research had been growing in all sorts of directions, but had oddly neglected the elaborate, stringent experimental study of the possibility of transmission of thought from one person to another under conditions permitting statistical evaluation of the results.

This extraordinary deficiency began rapidly to be rectified in 1934 when J. B. Rhine of Duke University, published the results of some 90,000 tests, many of them done with considerable distance between observer and the thing to be observed, and uniformly evaluated by statistical procedure. A dent was at last made on the scientific intellect, for this was the elaborate study long demanded. Controversy in the psychological journals was extensive and the favorable and unfavorable evaluations took up much space. Still, however, there was no single book to cover the entire experimental literature of the field of the alleged telepathic and clairvoyant phenomena.

The book now under consideration is an attempt to survey and evaluate the entire history of experimental work in this field, with critical attention to all the points raised in the controversial literature of the last ten years. It is, therefore, a mild statement of the case to say that no seasoned judgment regarding the evidence in this matter can be reached without studying the material presented here, and that the book will serve as a guide to the considerable source material and critical discussion of the problem.

The volume undertakes to present all the experimental and quantitative material on extra-sensory perception accumulated during a 60 year period, with heavy emphasis upon the work published from 1934 to the present. Experiments are grouped by problem and method. A series of 35 objections currently raised or implied regarding the ESP hypothesis are analyzed, and a sustained effort made to show that whether taken singly or together they fall far short of explaining the bulk of experimental data.

Special attention is given to six experiments performed in recent years, in which extreme precautions have been taken, the subject being separated from the stimulus either by screens or long distance, with independent recording of stimulus material and subject's impressions. The reader who has followed this literature will recognize reference here to such studies as the Riess long-distance experiment and the Pratt-Woodruff experiment with two experimenters and an independent recorder of scores. To the reader who has not read the original reports, any summary here will necessarily appear arbitrary. It is sufficient to say that the objections raised by contemporary psychologists are discussed at considerable length. The controversy seems to center mostly around the possibility of unconscious errors in preparation, recording, or scoring of material. It is fair to say that practically all scientific experimentation could be swept away if the recourse to a hypothesis of large-scale systematic errors of this sort were legitimized. On the other hand, it is equally fair to say that the body of science is mostly made up of *repeatable* experiments, in the strict sense that results obtained by one trained investigator are obtainable by another trained investigator working independently. In this sense, the genuinely repeatable experiment has not yet been contrived.

The problem then is to explain, if one can, the amazing succession of statistically clear-cut results which have come from several dozen experimenters, including the air-tight studies mentioned above and, at the same time, note that many other investigators, some of whom, at least, have tried to follow the specifications, have obtained only such results as should be expected from "chance." It is fair to point out that many steps in the progress of science are made haltingly here and there long before the main vanguard of science finds it possible to follow. I believe that the following generalization will be accepted by most dispassionate readers of this volume whether inclined towards or away from accepting the ESP hypothesis: there is a considerable body of experimental work indicating a contact between an organism and an object not acting through the senses, but leaving the ultimate interpretation of the nature of such contact completely obscure.

The most valuable part of the present volume, in the reviewer's judgment, is a series of chapters near the end which relate to the physical and psychological conditions which seem to favor the ESP function. Interest, confidence, morale, an easy relation between experimenter and subject, sufficient knowledge of previous results to keep the motivation-level high, freedom from annoyance, distraction, illness and fatigue—these appear to be important. A long series of experimental studies of favorable physiological

conditions and favorable psychological disposition of the subject are now contemplated by Dr. Rhine and his associates, following the several investigations along these lines already reported.

The issue then boils down to this: if the experimenters can find the variables which favor the phenomenon, they can work gradually to the point of producing the phenomena more or less at will. When this is done, the phenomenon will cease to be a foreign body in the tissues of science; it will be assimilated and used. The time for *a priori* rejection of unpalatable results from laboratories is past; the time for a complete establishment of ESP as an integral part of modern psychology has not come. What is needed is more of the kind of air-tight, psychologically sophisticated research that Dr. Rhine is now carrying on, with special emphasis upon favorable psychological conditions and more and more effort from the Duke experimenters to tell just how the experiments can be repeated by impartial investigators in their own laboratories.

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GRADUATE MEDICAL EDUCATION. A Report of the Commission on Graduate Medical Education, 1940. (Chicago, Ill.: University of Chicago Press, 1940.)

This volume, consisting of 297 pages, with a foreword, table of contents, appendixes and index, may be considered as complementary to the final report of the Commission on Medical Education published in 1932. The latter dealt with the objectives and problems of undergraduate medical education, and touched briefly upon graduate medical education. The present volume, dealing exclusively with the latter, includes chapters on the internship, residency, postgraduate medical education and specialty boards and, as a corollary upon the general subject, a chapter on post-graduate medical education in Great Britain. The appendixes embrace comparative statistical information upon the subjects dealt with in the report and, also, some existing programs of postgraduate medical education.

The Commission was the outgrowth of an action taken by the Advisory Board of Medical Specialists at their meeting in Atlantic City, June 6, 1937, the Commission being organized December 4 of that year. Its activities were financed by the Rockefeller Foundation, the Carnegie Corporation, the Josiah Macy, Jr. Foundation and other organizations and societies interested in the problem.

A brief summary of the broad purposes of the Commission's activities may be gathered from the following statement: "'Potent factors are today at work developing a greater interest in educational problems in the field of medicine, as in all other fields of human endeavor. Educational advancement in this field cannot be confined to the four year medical course but must include the internship, the residency and postgraduate education. This coordinated educational program, in medicine, has for its primary objectives prevention of disease and improvement in the medical service to the people of this country."

In discussing the internship as an aspect of graduate medical education the report emphasizes that it should be regarded as a part of a basic preparation of the student for general practice; and as a real educational experience, under supervision and designed to complete a clinical clerkship of the medical course. It should be considered an important responsibility of the staff and directed by members who are competent to provide necessary instruction and constitute a joint responsibility of medical schools and of hospitals. In short, it should aim to provide a satisfactory and fundamental preparation for general medical practice.

The report specifies that two outstanding problems concerning internships press for solution. The first of these is a definition of the purposes and functions of an internship, and the second is the development of a type of internship that will have educational and other values necessary to fulfill the defined purposes and function. Improvements of the educational contents of an internship are considered an important problem. "One of the objectives toward which the internship program is aimed is the development of a family doctor who will be able to practice general medicine, pediatrics, obstetrics, surgical diagnosis, minor surgery and first aid, and who emphasizes preventive medicine and early diagnosis" and is "alert to the medico-psychiatric aspects of all cases under his care."

The report considers a residency as a graduate discipline as opposed to that of a general internship. It seeks to prepare medical men as specialists in the various fields. To accomplish this a residency must follow a carefully prepared program affording increasing experience and responsibility. Several of the specialty boards have set the length of residency at three years, although this period is regarded in some quarters as insufficient. Specialty boards on the basis of the needs of true specialization, require a period of training in the basic sciences and medical schools will be called upon to provide much of that work. Schools of medicine, therefore, have an unusual opportunity to assist in the development of a rounded program in graduate medicine in cooperation with hospitals and the rendering of the basic sciences more dynamic.

The report indicates that a resident with a special aptitude should be encouraged to undertake a properly organized project of significant research relating to his clinical interest. It points out also that hospitals that cannot develop programs of a true educational content for interns or residents might properly appoint salaried house officers who have completed an internship. They should not, however, under such circumstances, expect organized educational opportunities that would prepare them for the practice of a specialty. In general, a residency is considered as the most satisfactory method of graduate training for specialized medical practice. It should include preparation in the sciences basic to the specialty, with sufficient clinical experience to insure competence, and constitute a joint responsibility of medical schools and those hospitals that can provide such services on a satisfactory educational standard.

The function of postgraduate medical education should be designed to keep the medical practitioner abreast of his field but not to qualify him for entering a new type or field of special practice. The needs of general practitioners and of specialists call for two special types of postgraduate opportunity. The report is less specific concerning the qualifications of teachers necessary for the success of postgraduate education. It is believed, however, that postgraduate physicians learn more rapidly from demonstrations and informal discussions and, in principle, require material to be presented in the most practical and usable form, and as applicable to their practice.

Postgraduate instruction for practicing specialists should not only embrace a thorough understanding of new advances in their own field but should include at least a working knowledge of other advances in the entire field of medicine.

The report concludes that postgraduate medical education should not attempt to qualify physicians for entering specialized fields of practice but should aim to keep the physician abreast of current knowledge. Postgraduate instruction automatically divides itself into two categories; namely, instruction for general practitioners and for those already qualified as specialists. The report emphasizes also that such instruction should be offered only by those qualified to provide it satisfactorily and that it "should be coordinated by existing agencies in each state that are concerned with the health and the medical care of the population." Because preventive medicine and functional disturbances resulting from environmental conditions are assuming so much importance in general practice, and, because they have not been given prominent places in the undergraduate medical curriculum in the past, there is special need to emphasize these aspects in postgraduate education. In fact, the report states it is "necessary to give special attention to preventive medicine and to psychiatric implications of practice in their own right"; and that "the time is now ripe for the development of broad standards of educational content of postgraduate work, standards that will emphasize objectives and stimulate higher achievement without inhibiting widespread experimentation with means and methods."

W. L. T.

THE NEUROGENIC BLADDER. By FREDERICK C. MCLELLAN, M. S., M. D. (Baltimore: Charles C. Thomas, 1939.)

"The Neurogenic Bladder" is based upon cystometric studies of bladder function considered primarily from a neurological rather than a urological viewpoint. In the early chapters the author gives a brief but comprehensive review of the neuro-anatomy and neuro-physiology of the bladder. His experiments emphasize the rôle played by the parasympathetic nervous system in bladder physiology as opposed to the rather minimal and indefinite rôle played by the sympathetic nervous system.

Consideration is given to the methods of cystometry and a classification is derived which places most of the dysfunctions of the bladder under the following headings:

(1) The uninhibited neurogenic bladder in which the sensory pathways are intact.

(2) The reflex neurogenic bladder resulting from widespread disease of the upper motor neurons and in which sensation is abolished.

(3) The autonomous neurogenic bladder resulting from nuclear or infranuclear lesions with interruption of both afferent and efferent fibers of the reflex arc. There is absence of voluntary or reflex micturition and sensation is abolished.

(4) The atonic neurogenic bladder resulting from lesions of the posterior sacral roots.

Examples are given of the various pathological pictures in which the different types of bladder dysfunction are found; and broad principles of treatment are outlined on the basis of the clinical and cystometric findings.

The latter part of the book is devoted to a summarizing chart of 100 cases studied by the cystometric method by the author, and to graphs showing the findings in the various classifications noted above.

F. G. E.

THE SCIENTIST IN ACTION. By *William H. George.* (New York: Emerson Books, Inc., 1938.)

The basic premise of this book is that scientific research is a form of human action, the first *sine qua non,* therefore, a research worker. This point of view is consistently maintained and yields an essentially new orientation, for while for many years we have been taught to allow for the "personal equation" in all scientific observations we do not habitually configurate the scientist with his production. Instead, we conceive him as outside and detached from it but capable by highly technical manipulations of isolating in his laboratory bits of Absolute Truth or returning from it with some priceless "chip of reality" as the miner comes out with his nuggets of gold. This is because Truth and Reality are still assumed by most of us to represent the attainable goals of science. George, on the other hand, in line with many of the best scientific thinkers of today, holds that it yields but two kinds of results—human but impersonal observations called facts, and such arrangements of facts as classifications, laws and theories. Facts are defined as "judgments of coincidence" or "coincidence observations" while the arrangement of facts is called "patterning." The test of any theory is not whether it is "true" but how well it fits the facts.

His analysis of the three barriers to the scientific approach challenges both the psychologist and the philosopher. The first barrier he conceives to be *newness,* for dealing with the new is unavoidable in research and with adults this quality, he finds, arouses either attack or escape reactions. The other two barriers, of interest primarily to students of ethics, are what he terms the "should-ought mechanism" and the "assessment of value," both of which he justifiably rules out of science.

Another mythical dragon which this modern St. George goes out to slay is the commonly accepted concept of causation. In lieu of the belief in some almost demonological force within which *causes* a certain sequence of events he substitutes bare description of the series. Thus "gravitation is a mental

concept which makes a pattern or completed whole of a vast number of coincidence observations upon falling apples, tides and planets." While not a new attack, since in recent years causation has repeatedly been defined simply as concomitant variation, it is a necessary one in any exposition of the scientific method for primitive beliefs are hard to exorcise.

Undoubtedly the most surprising statement in the book to a psychologist occurs in the concluding section, "Personal Basis," where he confesses to having had no knowledge of the Gestalt School until the manuscript was finished. His whole discussion of patterning might well have been taken bodily from Köhler. Indeed the very illustrative figures used are the classic ones familiar to all students of Gestalt theories of perception. While he does not actually use the term "closure" that is what he means by the "tension produced when an observer sees something as a pattern with a gap in it," and the "feeling of relaxation experienced when the gap is closed so that all the parts of the pattern fit into their expected places." His discussion of patterns in games is original and interesting.

Though himself a physicist, George, with the versatility which we have become accustomed to find in British scientists and men of letters, brilliantly supports his argument with illustrations from many other fields of science and from medicine. Besides the fight-escape principle already alluded to, psychologists will be especially interested in his references to "superiority" as a defense mechanism, perception as conditioned by attitude and by his reliance on the theory of patterning to explain all human action. He shows familiarity not only with the work of Bechteref, Pavlov, Watson and McDougall but also with psychoanalytic thought. However, he rejects the concept of the unconscious because it is tied up with a causal theory of behavior and by so doing cuts himself off from the analytical explanation of imagination. While he considers this faculty essential to the scientist he confesses that it is a "complete mystery" to him. Apparently he is not familiar with "The Road to Xanadu"—Lowes' masterly analysis of the sources of creative imagination.

Despite the fact that the book deals primarily with methodology and necessarily with very abstract concepts it is simply and clearly written and deserves a wide audience. Not only does it offer a succinct statement of the present position of science valuable to the working scientist who too often loses sight of the forest for the trees, but it should commend itself as well to the intelligent layman interested less in the data of a particular field than in obtaining a general understanding of the scientific frame of reference. Its great usefulness however should be in the university where now, as George ironically points out, science, but no scientific method, is taught to science students, and scientific method, but no science, to a small proportion of Arts students by philosophers who usually have had little or no experience in any science.

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THE MIND OF MAN: The Story of Mens' Conquest of Mental Illness. By *Walter Bromberg.* (New York and London: Harper & Bros., 1939.)

It is a curious phenomenon that in spite of the tremendous development of psychiatry in English speaking countries, there is no adequate history of psychiatry in the English language. The present volume obviously intended for popular consumption almost fills the gap; but like so many books of this type it is too specialized for the lay reader and somewhat incomplete and sketchy for the serious student. However, the author has been able to include a great deal of essential data in a relatively short, popular monograph.

The author makes an interesting observation as to the cause of the delay in the development of psychiatry as compared with other branches of medicine. During the Greco-Roman period there was a much better understanding of maladjustments than in the Middle Ages or even in the Renaissance period. With the development of Christianity, the various nations of Europe did not give up their beliefs in pagan gods and these were incorporated in Christian theology as saints and devils. The opposition to Christianity found its expression in cults of devil worshippers, and the church dealt with it by taking upon itself the responsibility of ridding man of the domination of evil spirits. Mental disease was chosen as an evidence of possession by the devil; mental diseases and their cure became the province of the church. This state of affairs continued through the Middle Ages almost until the Renaissance when the first attempts were made by the Dominican monks to separate mental disease from demoniacal possession. Meanwhile the other branches of medicine already free from the influence of the church were able to develop.

The author describes this evolution of psychiatry in chapters on witchcraft and mass delusion; the emancipation of psychiatry is outlined under the caption, "The Devil Loses Dominion over the Insane." He proceeds then to the more spectacular figures in European psychiatry such as Mesmer, the various founders of hypnotism and faith healing. The last chapters are devoted to a discussion of the more rational types of therapy.

This book exploits the distressing fact that we still have too many "schools" in psychiatry, too many jealous teachers and even more jealous students. It is unfortunate that the author has not demonstrated the present development of psychiatry as a biological and social science, but this may be beyond the scope of this volume. Unquestionably this work is a good beginning, and it is hoped that it may be expanded into a real history of psychiatry as the author seems to possess both the competence and imagination to do it.

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TEXTBOOK OF NERVOUS DISEASES. By *Robert Bing, M.D.* Translated by *Webb Haymaker, M.D.* (St. Louis: C. V. Mosby Co., 1939.)

Professor Bing's *Lehrbuch der Nervenkrankheiten* made its first appearance in 1913. It is now in its fifth edition and has become recognized as a

standard textbook in many countries. It is a very happy and welcome event to have this latest edition made available to the English speaking peoples. The translator has rearranged the material, making additions in various parts of the text, with a view to better adaptation to American and British usage.

The systematic ordering of the subject matter as in preceding editions has in general been followed, and an exceptionally full and detailed index greatly facilitates quick reference. Many readers of the JOURNAL will be familiar with Bing's textbook in original editions and will recall the lucidity of his style and his clear and precise illustrations of clinical conditions. In the words of Wartenberg in his preface to the present American edition: "As presented by Bing, neurology attains almost the exactness of mathematics." An extensive bibliography follows each chapter.

There is a comprehensive discussion of the endocrine disorders, hypothalamic syndromes and diseases of the autonomic nervous system. There is an especially satisfactory chapter on convulsive disorders and allied conditions, following which is a chapter dealing with the various kinds of headache, and at the end of the book a fairly extended section covering the psychoneuroses. The discussion of these conditions may be described as conservative and commonsense. In treatment the author is eclectic and refuses to recognize any school as having unique authority. He deals somewhat severely with the indiscriminate use of psychoanalysis.

Throughout the book there is evidence of an effort to take advantage of the latest developments in the various fields up to the time of the revision of the text. The author is concerned less with theories than with established facts and the utmost clearness of their presentation and interpretation. There are 207 illustrations throughout the text including 9 in colour.

C. B. F.

In Memoriam.

NATHANIEL HAWLEY BRUSH, M. D.

1887–1940.

Dr. Brush died October 21, 1940, aged fifty-three years, of carcinoma of the pancreas and biliary obstruction.

He was born June 23, 1887, at the men's department of the Pennsylvania Hospital, Philadelphia, where his father was resident physician. Early in life he suffered from coxalgia which left him with a slight limp which fortunately did not interfere with his ordinary activities. He was the only son of Dr. Edward Nathaniel Brush (former president of the American Psychiatric Association and former editor of the American Journal of Psychiatry) and Delia Hawley Brush. His father became Superintendent of The Sheppard Asylum in 1891 at Towson, Maryland. The name of this institution was later changed to The Sheppard and Enoch Pratt Hospital to fulfill a conditional bequest of Enoch Pratt, a philanthropist of Baltimore. With this early environment and the example of his father it was natural for Dr. Brush to adopt psychiatry as his specialty. His early education was received from governesses and at the Gilman Country School. He entered Johns Hopkins University from which he received the degree of Bachelor of Arts in 1909 and graduated from the medical school of the same institution in 1914. He served as intern and resident psychiatrist at The Henry Phipps Psychiatric Clinic and was also an instructor in psychiatry. In 1918 he entered military service with rank of captain.

In 1919 Dr. Brush moved to Santa Barbara, California, where he entered private practice in psychiatry. At one time he was president of the Santa Barbara Medical Society, and he was also on the staff of the Santa Barbara Cottage Hospital. He was a member of the American Psychiatric Association and of the Association for Research in Nervous and Mental Disease.

Dr. Brush was married to Lorraine Stroh Baker in 1925, and later he married Mrs. Anna Ladd Cutter Cochran who survives him. Also surviving are two sisters, Mrs. W. Hall Harris, Jr., of Baltimore, and Mrs. Lloyd P. Shippen of Washington, D. C.

Dr. Brush's interests were centered mainly in his chosen profession and specialty. As a young man he played tennis and baseball, and in later years golf. He was much interested in photography as his father had been, and delighted to take automobile trips exploring the country. Boulder Dam was an especial interest during its construction.

W. R. D.